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United States  
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Pacific  
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Region

Columbia River  
Gorge National  
Scenic Area



# Draft Environmental Impact Statement

for the

## Sandy River Delta Plan



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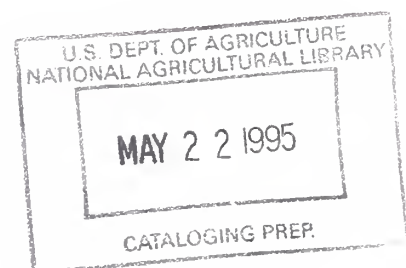
# **Environmental Impact Statement**

*for the*

## **Sandy River Delta Plan**

U.S. Department of Agriculture  
Forest Service  
Columbia River Gorge National Scenic Area  
902 Wasco Avenue  
Hood River, Oregon 97031

January 1995





**Draft Environmental Impact Statement  
for the  
Sandy River Delta Plan**

**Columbia River Gorge National Scenic Area  
Multnomah County, Oregon  
January 1995**

**Lead Agency:** USDA Forest Service

**Responsible Official:** Arthur J. Carroll, Manager  
Columbia River Gorge National Scenic Area  
902 Wasco Avenue  
Hood River, Oregon 97031

**For more information  
or comments, contact:** Virginia Kelly, Project Manager  
Columbia River Gorge National Scenic Area  
902 Wasco Avenue  
Hood River, Oregon 97031  
(503) 386-2333

**Abstract:** Five alternatives for the management of the Sandy River Delta and two alternatives for improvements to Jordan Road and the interchange with Interstate 84 (I-84) are described and compared in this Draft Environmental Impact Statement (EIS). Alternative 1 is the no action alternative--no landscape enhancement, recreational facilities, or road improvements would be undertaken. Alternative 2 would emphasize recreational development and maximize landscape diversity. A staffed gateway facility would be located north of I-84 on National Forest Land. Alternative 2 includes the realignment of Jordan Road along Broughton Bluff and construction of a folded diamond interchange. Alternative 3 emphasizes open habitats throughout the site (meadows and open water), a moderate level of recreational development, and locating a staffed gateway south of I-84. Alternative 3 includes the same interchange and road access improvements as Alternative 2. Alternative 4 would re-create a forested riparian habitat on the Delta (similar to that reported by early European explorers) and minimize recreational development north of I-84. The western gateway would be a kiosk located south of I-84. Jordan Road would be realigned to run between I-84 and the Union Pacific Railroad and a new interchange in a diamond configuration would be constructed. Alternative 5 would reforest the northern and western parts of the Delta, but maintain open habitat in the southeastern portion, with a moderate level of recreational development. The western gateway would be a kiosk located south of I-84 (like Alternative 4), and the road improvements and interchange would be the same as Alternative 2. Alternative 5 is the alternative preferred by the Forest Service (FS).

**COMMENTS ON THE DRAFT EIS MUST BE RECEIVED BY MARCH 20, 1995.**

Reviewers should provide the FS with their comments during the review period for the Draft EIS. This will enable the FS to analyze and respond to the comments at one time and to use information provided in the Final EIS, thus avoiding undue delay in the decision-making process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to the reviewers' position and contentions (*Vermont Yankee Nuclear Power Corp. v. NRDC*, 435 U.S. 519, 553 (1978)). Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the Final EIS (*City of Angoon v. Hodel* (9th Circuit, 1986) and *Wisconsin Heritages, Inc. v. Harris*, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980)). Comments on the Draft EIS should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (14 CFR 1503.3).



## SUMMARY

This Draft EIS evaluates: (1) alternatives for the development and management of the Sandy River Delta and (2) alternative improvements to Jordan Road and the Jordan Road interchange with Interstate 84 (I-84) to provide access to the site and support proposed development. The Sandy River Delta is designated a Special Management Area (SMA) in the Columbia River Gorge National Scenic Area Act (CRGNSA Act). The SMA Management Plan calls for the development of a plan for the Sandy River Delta which would accommodate recreational uses, open space, and a western gateway facility to inform and disperse visitors to the Columbia River Gorge National Scenic Area (NSA). The no action alternative and four action alternatives for landscape pattern, recreational development, gateway location, and facilities are described and evaluated in this Draft EIS. In addition, three configurations for Jordan Road and the Jordan Road interchange with I-84 are described and evaluated, including the "no action" alternative.

The alternatives represent combinations of the major "components" (i.e., landscape patterns, gateway location recreational improvements, interchange designs and management strategies) that would be the most feasible when implemented together. However, certain components are interchangeable or could be "mixed and matched." For example, the folded diamond interchange design could be used in Alternative 4 instead of the diamond interchange design if it is determined that it would mitigate a potentially significant effect. As another example, either of the gateway facilities in Alternatives 3 or 4 could be used in place of the one identified for Alternative 2 to mitigate a potentially significant effect resulting from the gateway facility shown in Alternative 2. Thus, interchanging of certain project components mitigation for impacts of each Alternative.

### *Overview of Landscape Patterns for Five Alternatives*

Alternative 1, the no action alternative, would continue current vegetation management in the study area. Ultimately, the site would reforest, but with an understory of invasive, non-native species. Alternatives 2 through 5, the four action alternatives, would represent a reasonable range of landscape enhancement options; including a diverse landscape (Alternative 2), an emphasis on open habitats including increased open water (Alternative 3), and an emphasis on forested habitats (Alternative 4). Alternative 5 would combine forested (on Sun Dial Island) and open habitat (on the Thousand Acres).

### *Overview of Gateway, Recreation and Support Facilities for Five Alternatives*

The options for the gateway and recreational facilities provided by the alternatives (within the parameters set by the NSA Management Plan) represent a range of experiences for users of the Delta. Alternative 1 would not provide a gateway, and would maintain the types of recreational uses currently allowed in the study area. Alternative 2 would include construction of a major gateway facility on National Forest land north of I-84, and would provide the most

intensive and extensive recreational improvements (trails, equestrian facilities, boating and fishing access, picnic sites, etc.). It would also provide the most support facilities (e.g., caretaker's residence, restoration center, restrooms, parking, etc.). Alternative 3 would locate a gateway facility (smaller than the one in Alternative 2) south of I-84 on land currently owned by ODOT and OPRD, and would provide a moderate level of recreational improvements, uses, and support facilities. Alternative 4 would minimize human use of the site by locating only a small unstaffed information kiosk south of I-84, providing the minimum level of recreational improvements and support facilities, and restricting permitted uses, compared to Alternatives 2 and 3. Alternative 5 would also use a kiosk south of I-84 for gateway functions, but would have a moderate level of recreational development north of I-84.

### *Overview of Interchange Design Options and Options for Location of Jordan Road*

Alternative 1 would involve no improvements to Jordan Road and the interchange. Alternatives 2, 3, and 5 would utilize a folded diamond interchange design, along with relocating Jordan Road's undercrossing of the Union Pacific Railroad (UPRR) and I-84, and realigning the road along Broughton Bluff south of the UPRR. Alternative 4 would use a diamond interchange design, but would maintain the existing UPRR undercrossing location of Jordan Road and would not realign the road, south of the UPRR.

The Forest Service (FS) prefers Alternative 5. If this alternative is implemented, the following impacts will occur:

1. The FS will acquire land between the UPRR and I-84 for construction of a gateway kiosk, parking lot, and picnic area.
2. Jordan Road will be realigned near the base of Broughton Bluff, and the "old" Jordan Road alignment will become a bicycle and pedestrian trail.
3. A new Jordan Road interchange will be constructed approximately 1,300 feet east of the existing interchange.
4. The I-84 bridges (one in each direction) over the Sandy River will be widened to provide a weave/merge lane in each direction and bicycle/pedestrian path along the north side of the westbound bridge.
5. Six to nine miles of hiking and biking trails will be developed north of I-84.
6. Equestrian uses and camping will no longer be permitted north of I-84. Gathering special forest products, hunting, and exercising pets will be permitted under certain restrictions. Other existing uses will continue as currently allowed.
7. A caretaker's residence and restoration center with 100 parking spaces will be constructed north of I-84 on National Forest land.

8. The existing boat moorage would be moved 0.6 miles north of its current location.
9. Vegetation management will be implemented north of I-84 to achieve an open habitat (including wetlands and open water) on the south and eastern areas (the Thousand Acres) and forested habitat on the north and western parts (Sun Dial Island) of the site. Possible vegetation management techniques will include mowing, removal of the top 12 inches of soil, herbicide application, controlled burning, flooding, and grazing. Different techniques will be used in different areas.

All of the action alternatives would have beneficial effects on natural and scenic resources, recreation, access, and safety in the project area. The decision focuses on the balance between these beneficial uses. That is, the issues raised during scoping and addressed in this Draft EIS relate to the balance between recreation and natural resources, access and scenic resources, etc., recognizing that all will be enhanced to some degree.



## ORGANIZATION OF THIS DRAFT EIS

The main body of this EIS is organized into fourteen chapters plus a summary section at the beginning of the document. The chapters are listed below.

### Summary

- 1.0 Purpose and Need
- 2.0 Alternatives
- 3.0 Affected Environment
- 4.0 Environmental Consequences
- 5.0 Summary of Probable Adverse Environmental Effects That Cannot Be Avoided
- 6.0 Short-Term Uses Versus Long-Term Productivity
- 7.0 Irreversible and Irretrievable Commitment of Resources
- 8.0 Compliance With Section 4(f) and 6(f) Requirements
- 9.0 Other Specifically Required Disclosures
- 10.0 List of Preparers
- 11.0 List of Agencies, Organizations, and Persons Contacted
- 12.0 References Cited
- 13.0 Glossary of Acronyms and Terms
- 14.0 Index

The Appendix provides material that supports the information in the EIS. A list of appendices is provided below.

### A. SHPO Consultation

In addition to the Appendices, technical memoranda and studies were prepared which provided background information and data used in the preparation of this EIS. These and all references cited are available for review at Columbia River Gorge NSA office, located at 902 Wasco Avenue, Hood River, Oregon 97031. In addition, all technical documents related to the Jordan interchange modification are available at the ODOT office located at 123 Front Avenue, Portland, Oregon, 97201.



**LIST OF ACRONYMS AND ABBREVIATIONS**

The following acronyms and abbreviations are used in this Draft EIS.

AASHTO	American Association of State Highway and Transportation Officials
ACOE	U.S. Army Corps of Engineers
ADA	Americans with Disabilities Act
AQMA	Air Quality Maintenance Area
BLM	Bureau of Land Management
BPA	Bonneville Power Administration
CAAA	Clean Air Act (of 1990) and Amendments
CFR	Code of Federal Regulations
cfs	cubic feet per second
CRGC	Columbia River Gorge Commission
CRGNSA	Columbia River Gorge National Scenic Area
CWA	Clean Water Act
CO	carbon monoxide
dba	decibels, A scale
dbh	diameter at breast height
DEQ	Oregon Department of Environmental Quality
DFC	desired future condition
DLC	Donation Land Claim
DSL	Oregon Division of State Lands
EIS	Environmental Impact Statement
EMF	electromagnetic field
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
FEMAT	Forest Ecosystem Management Assessment Team
FHWA	Federal Highway Administration
FS	Forest Service (U.S. Department of Agriculture)
FSH	Forest Service Handbook
FSM	Forest Service Manual
GMA	General Management Area (of the NSA)
gpd	gallons per day
gpm	gallons per minute
HCRH	Historic Columbia River Highway
IA	(confirm on p. 3-9) synthetic rainfall distribution measurement
IDT	interdisciplinary team
kg	kilogram
K <sub>oc</sub>	(K) = constant; (oc) = organic carbon
K <sub>s</sub>	(K) = constant; (s) = soil
l	liter
LD <sub>50</sub>	lethal dose causing 50 percent mortality (see glossary for further detail)
Leq	equivalent noise level

LOS	level of service
L&WCF	Land and Water Conservation Fund
Metro	used to be Metropolitan Service District, but the name has been officially shortened to Metro)
mg	milligram
MHNF	Mt. Hood National Forest
mph	miles per hour
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act (of 1969), as amended
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOx	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NSA	National Scenic Area (Columbia River Gorge)
NWI	National Wetlands Inventory
NWPC	National Pipeline Corporation
O&M	Operations and Maintenance
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
OPRD	Oregon State Parks and Recreation Department
ORNC	Oregon Railway and Navigation Company
ORV	off-road vehicles
PAOT	persons at one time
ppm	parts per million
RIC	recreation intensity class
ROD	Record of Decision
ROW	right-of-way
RTP	Regional Transportation Plan
SCS	Soil Conservation Service (U.S. Department of Agriculture)
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SMA	Special Management Area (of the NSA)
SOR	system operation review
SOS	System Operation Strategies
ST&E	sensitive, threatened, and endangered (species)
STIP	Statewide Transportation Improvement Program
TIP	Transportation Improvement Program
TSP	total suspended particulates
UBC	Uniform Building Code
UPRR	Union Pacific Railroad
USDA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation

USFWS	Fish and Wildlife Service (U.S. Department of the Interior)
USGS	U.S. Geological Survey
VMS	Visual Resources Management
VOC	volatile organic compound (including benzene, toluene, formaldehyde, xylene, etc.)
VQO	Visual Quality Objective
WRD	Oregon Water Resources Department



## TABLE OF CONTENTS

	Page
1.0 PURPOSE AND NEED FOR ACTION .....	1-1
1.1 INTRODUCTION .....	1-1
1.2 PROJECT AREA LOCATION AND DESCRIPTION .....	1-1
1.3 PROPOSED ACTION .....	1-3
1.3.1 Related Agencies' Actions .....	1-5
1.4 PURPOSE AND NEED .....	1-6
1.4.1 Sandy River Delta Plan .....	1-6
1.4.2 Jordan Interchange Modification .....	1-7
1.4.3 Lewis and Clark State Park Parking and River Access .....	1-8
1.5 DECISIONS TO BE MADE .....	1-8
1.5.1 Programmatic .....	1-8
1.5.2 Site-Specific .....	1-9
1.6 PLANNING FOR THE PROJECT AREA .....	1-9
1.6.1 Columbia River Gorge NSA Act .....	1-9
1.6.2 Columbia River Gorge NSA Management Plan .....	1-10
1.6.3 Mt. Hood National Forest Plan .....	1-11
1.6.4 President's Plan .....	1-11
1.6.5 OPRD Columbia Gorge District Parks Master Plan .....	1-13
1.6.6 Planning for the Sandy River Delta .....	1-15
1.6.7 Jordan Road Interchange with I-84 .....	1-15
1.7 PUBLIC INVOLVEMENT .....	1-16
1.8 SIGNIFICANT ISSUES .....	1-17
1.9 OTHER ACTIONS AND PERMITS .....	1-21
2.0 ALTERNATIVES .....	2-1
2.1 INTRODUCTION .....	2-1
2.2 ALTERNATIVES ELIMINATED FROM DETAILED STUDY .....	2-2
2.2.1 Land Use Alternatives Eliminated From Detailed Study .....	2-2
2.2.2 Interchange Alternatives Eliminated From Detailed Study .....	2-3
2.3 ALTERNATIVES CONSIDERED IN DETAIL .....	2-4
2.3.1 Design Guidelines, Management Strategies and Implementation Considerations Common to All Action Alternatives .....	2-6
2.3.2 Detailed Description of Alternatives .....	2-18
2.4 COST ESTIMATE .....	2-35
2.5 SUMMARY OF EFFECTS ON KEY ISSUES .....	2-37
3.0 AFFECTED ENVIRONMENT .....	3-1
3.1 INTRODUCTION .....	3-1
3.2 SOILS AND GEOLOGY .....	3-1
3.2.1 Topography .....	3-1

## TABLE OF CONTENTS, Continued

	Page
3.2.2 Soils .....	3-1
3.2.3 Geology .....	3-2
3.2.4 Mineral and Energy Resources .....	3-4
3.3 HYDROLOGY .....	3-4
3.3.1 Climate .....	3-4
3.3.2 Geomorphology .....	3-5
3.3.3 Surface Water Hydrology .....	3-5
3.3.4 Groundwater Hydrology .....	3-8
3.3.5 Wetlands .....	3-10
3.4 NATURAL RESOURCES .....	3-11
3.4.1 Vegetation .....	3-14
3.4.2 Wildlife and Wildlife Habitat .....	3-15
3.4.3 Fisheries .....	3-21
3.5 CULTURAL RESOURCES .....	3-22
3.5.1 Cultural History .....	3-23
3.5.2 Cultural Resources .....	3-26
3.5.3 Cultural Resource Protection .....	3-27
3.6 LAND USE AND PLANNING .....	3-28
3.6.1 Existing Land Uses on the Site .....	3-28
3.6.2 Surrounding Land Uses .....	3-30
3.6.3 Plans, Policies and Regulations .....	3-31
3.7 RECREATION .....	3-36
3.7.1 NSA Management Plan/Recreation Development Plan .....	3-36
3.7.2 OPRD Columbia River Gorge District Master Plan .....	3-37
3.7.3 Existing Recreation Uses .....	3-38
3.8 SCENIC RESOURCES .....	3-40
3.8.1 Scenic Resources Management .....	3-40
3.8.2 Landscape Setting .....	3-41
3.8.3 Key Viewing Areas .....	3-42
3.9 TRANSPORTATION .....	3-43
3.9.1 Existing Road System .....	3-43
3.9.2 Parking .....	3-46
3.9.3 Planned Transportation System Improvements .....	3-47
3.9.4 Bicycle and Pedestrian Facilities .....	3-47
3.9.5 Rail System .....	3-47
3.9.6 Bus Services .....	3-47
3.10 AIR QUALITY .....	3-48
3.10.1 Air Quality Standards .....	3-48
3.10.2 Existing Air Quality in the Portland AQMA .....	3-48
3.10.3 Air Quality Plans and Regulations .....	3-50
3.10.4 Existing Air Quality at the Project Study Area .....	3-50

**TABLE OF CONTENTS, Continued**

	<b>Page</b>
3.11 NOISE .....	3-51
3.11.1 Existing Acoustic Environment .....	3-52
3.12 UTILITIES AND SERVICES .....	3-54
3.13 SITE CONTAMINATION .....	3-56
 4.0 ENVIRONMENTAL CONSEQUENCES .....	 4-1
4.1 INTRODUCTION .....	4-1
4.2 SOILS AND GEOLOGY .....	4-1
4.2.1 Issues and Analysis Methodology .....	4-1
4.2.2 Alternative 1 - No Action .....	4-2
4.2.3 Alternative 2 .....	4-3
4.2.4 Alternative 3 .....	4-4
4.2.5 Alternative 4 .....	4-5
4.2.6 Alternative 5 .....	4-6
4.2.7 Cumulative Effects .....	4-6
4.2.8 Mitigation Measures .....	4-7
4.2.9 Summary .....	4-7
4.3 HYDROLOGY .....	4-8
4.3.1 Issues and Analysis Methodology .....	4-8
4.3.2 Alternative 1 - No Action .....	4-9
4.3.3 Alternative 2 .....	4-11
4.3.4 Alternative 3 .....	4-13
4.3.5 Alternative 4 .....	4-15
4.3.6 Alternative 5 .....	4-17
4.3.7 Cumulative Effects .....	4-18
4.3.8 Mitigation Measures .....	4-20
4.3.9 Summary .....	4-21
4.4 NATURAL RESOURCES .....	4-22
4.4.1 Issues and Analysis Methodology .....	4-22
4.4.2 Alternative 1 - No Action .....	4-22
4.4.3 Alternative 2 .....	4-24
4.4.4 Alternative 3 .....	4-30
4.4.5 Alternative 4 .....	4-34
4.4.6 Alternative 5 .....	4-36
4.4.7 Cumulative Effects .....	4-38
4.4.8 Mitigation Measures .....	4-40
4.4.9 Summary .....	4-41
4.5 CULTURAL RESOURCES .....	4-46
4.5.1 Issues and Analysis Methodology .....	4-46
4.5.2 Alternative 1 - No Action .....	4-47
4.5.3 Alternative 2 .....	4-47
4.5.4 Alternative 3 .....	4-48



## TABLE OF CONTENTS, Continued

	Page
4.5.5 Alternative 4 . . . . .	4-48
4.5.6 Alternative 5 . . . . .	4-49
4.5.7 Cumulative Effects . . . . .	4-49
4.5.8 Mitigation Measures . . . . .	4-50
4.5.9 Summary . . . . .	4-51
4.6 LAND USES AND PLANNING . . . . .	4-52
4.6.1 Issues and Analysis Methodology . . . . .	4-52
4.6.2 Alternative 1 - No Action . . . . .	4-53
4.6.3 Alternative 2 . . . . .	4-55
4.6.4 Alternative 3 . . . . .	4-57
4.6.5 Alternative 4 . . . . .	4-60
4.6.6 Alternative 5 . . . . .	4-62
4.6.7 Cumulative Effects . . . . .	4-63
4.6.8 Mitigation Measures . . . . .	4-64
4.6.9 Summary . . . . .	4-64
4.7 RECREATION . . . . .	4-65
4.7.1 Issues and Analysis Methodology . . . . .	4-65
4.7.2 Alternative 1 - No Action . . . . .	4-66
4.7.3 Alternative 2 . . . . .	4-67
4.7.4 Alternative 3 . . . . .	4-69
4.7.5 Alternative 4 . . . . .	4-70
4.7.6 Alternative 5 . . . . .	4-72
4.7.7 Cumulative Effects . . . . .	4-73
4.7.8 Mitigation Measures . . . . .	4-73
4.7.9 Summary . . . . .	4-74
4.8 SCENIC RESOURCES . . . . .	4-76
4.8.1 Issues and Analysis Methodology . . . . .	4-76
4.8.2 Alternative 1 - No Action . . . . .	4-77
4.8.3 Alternative 2 . . . . .	4-77
4.8.4 Alternative 3 . . . . .	4-79
4.8.5 Alternative 4 . . . . .	4-79
4.8.6 Alternative 5 . . . . .	4-81
4.8.7 Cumulative Effects . . . . .	4-82
4.8.8 Mitigation Measures . . . . .	4-82
4.8.9 Summary . . . . .	4-83
4.9 TRANSPORTATION/ACCESS . . . . .	4-84
4.9.1 Issues and Analysis Methodology . . . . .	4-84
4.9.2 Alternative 1 - No Action . . . . .	4-91
4.9.3 Alternative 2 . . . . .	4-92
4.9.4 Alternative 3 . . . . .	4-94
4.9.5 Alternative 4 . . . . .	4-96
4.9.7 Cumulative Effects . . . . .	4-99



## TABLE OF CONTENTS, Continued

	Page
4.9.8 Mitigation Measures .....	4-99
4.9.9 Summary .....	4-100
4.10 AIR QUALITY .....	4-102
4.10.1 Issues and Analysis Methodology .....	4-102
4.10.2 Alternative 1 - No Action .....	4-102
4.10.3 Alternative 2 .....	4-104
4.10.4 Alternative 3 .....	4-106
4.10.5 Alternative 4 .....	4-107
4.10.6 Alternative 5 .....	4-107
4.10.7 Cumulative Effects .....	4-107
4.10.8 Mitigation Measures .....	4-108
4.10.9 Summary .....	4-108
4.11 NOISE .....	4-109
4.11.1 Issues and Analysis Methodology .....	4-109
4.11.2 Alternative 1 - No Action .....	4-110
4.11.3 Alternative 2 .....	4-112
4.11.4 Alternative 3 .....	4-114
4.11.5 Alternative 4 .....	4-115
4.11.6 Alternative 5 .....	4-116
4.11.7 Cumulative Effects .....	4-116
4.11.8 Mitigation Measures .....	4-116
4.11.9 Summary .....	4-118
4.12 UTILITIES AND SERVICES .....	4-119
4.12.1 Issues and Analysis Methodology .....	4-119
4.12.2 Alternative 1 - No Action .....	4-121
4.12.3 Alternative 2 .....	4-121
4.12.4 Alternative 3 .....	4-124
4.12.5 Alternative 4 .....	4-125
4.12.6 Alternative 5 .....	4-127
4.12.7 Cumulative Effects .....	4-128
4.12.8 Mitigation Measures .....	4-129
4.12.9 Summary .....	4-130
4.13 SITE CONTAMINATION .....	4-132
4.13.1 Issues and Analysis Methodology .....	4-132
4.13.2 Alternative 1 -- No Action .....	4-136
4.13.3 Alternative 2 .....	4-137
4.13.4 Alternative 3 .....	4-138
4.13.5 Alternative 4 .....	4-139
4.13.6 Alternative 5 .....	4-140
4.13.7 Cumulative Effects .....	4-141
4.13.8 Mitigation Measures .....	4-141
4.13.9 Summary .....	4-143

**TABLE OF CONTENTS, Continued**

	<b>Page</b>
5.0 SUMMARY OF PROBABLY ADVERSE EFFECTS THAT CANNOT BE AVOIDED .....	5.1
6.0 SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY .....	6.1
7.0 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES ....	7-1
7.1 IRREVERSIBLE COMMITMENTS OF RESOURCES .....	7-1
7.2 IRRETRIEVABLE COMMITMENTS OF RESOURCES .....	7-1
7.2.1 Alternative 1 .....	7-1
7.2.2 Alternative 2 .....	7-2
7.2.3 Alternative 3 .....	7-2
7.2.4 Alternative 4 .....	7-2
7.2.5 Alternative 5 .....	7-3
8.0 COMPLIANCE WITH SECTION 4(F) AND SECTION 6(f) REQUIREMENTS ..	8-1
8.1 INTRODUCTION .....	8-1
8.2 DESCRIPTION OF RESOURCES .....	8-2
8.2.1 Section 4(f) Resources .....	8-3
8.2.2 Section 6(f) Resources .....	8-5
8.3 ALTERNATIVES AND THEIR EFFECTS OF 4(F) AND 6(F) RESOURCES .....	8-5
8.3.1 Avoidance Alternatives .....	8-5
8.3.2 Alternative 1 .....	8-5
8.3.3 Alternative 2 .....	8-5
8.3.4 Alternative 3 .....	8-7
8.3.5 Alternative 4 .....	8-7
8.3.6 Alternative 5 .....	8-8
8.3.7 Summary of Effects .....	8-9
8.4 MEASURES TO MINIMIZE HARM TO SECTION 4(f) AND SECTION 6(f) PROPERTIES .....	8-9
8.4.1 Alternative 1 .....	8-9
8.4.2 Alternative 2 .....	8-10
8.4.3 Alternative 3 .....	8-10
8.4.4 Alternative 4 .....	8-11
8.4.5 Alternative 5 .....	8-11
8.5 CONSULTATION AND COORDINATION WITH AFFECTED AGENCIES .....	8-12
9.0 OTHER SPECIFICALLY REQUIRED DISCLOSURES .....	9-1

## TABLE OF CONTENTS, Continued

	Page
10.0 LIST OF PREPARERS .....	10-1
10.1 USDA FOREST SERVICE, COLUMBIA RIVER GORGE NATIONAL SCENIC AREA .....	10-1
10.2 OREGON DEPARTMENT OF TRANSPORTATION .....	10-1
10.3 DAVID EVANS AND ASSOCIATES, INC. ....	10-1
10.3.1 Richard Sterling Shaffer, Landscape Architect .....	10-2
10.3.2 Cogan Owens Cogan .....	10-2
10.3.3 Archaeological Investigations Northwest, Inc. ....	10-2
10.3.4 McCulley, Frick, and Gilman .....	10-2
10.3.5 RZ Agra, Inc. ....	10-2
11.0 LIST OF AGENCIES, ORGANIZATION, AND PERSONS TO WHOM COPIES OF THE STATEMENT ARE SENT .....	11-1
11.1 FEDERAL AGENCIES .....	11-1
11.2 REGIONAL AGENCIES .....	11-2
11.3 STATE AGENCIES .....	11-3
11.4 ELECTED OFFICIALS .....	11-4
11.5 TRIBES .....	11-4
11.6 LOCAL GOVERNMENTS .....	11-4
11.7 NEWSPAPERS .....	11-5
11.8 LIBRARIES .....	11-5
11.9 ORGANIZATIONS .....	11-6
12.0 REFERENCES CITED .....	12-1
12.1 PUBLICATIONS AND DOCUMENTS .....	12-1
12.2 PERSONAL COMMUNICATIONS .....	12-4
13.0 GLOSSARY OF TERMS AND ACRONYMS .....	13-1
13.1 TERMS .....	13-1
13.2 ACRONYMS .....	13-11
14.0 INDEX .....	14-1

## LIST OF TABLES

	Page
1.9-1 Required Discretionary Actions or Permits . . . . .	1-22
2.3-1 Summary of Acres for Each Habitat Type . . . . .	2-5
2.3-2 Summary of Plant Typical of Each Habitat Type . . . . .	2-5
2.3-3 Summary of Gateway, Support, and Recreational Facilities . . . . .	2-7
2.3-4 Summary of Permitted Uses . . . . .	2-10
2.3-5 Summary of Management Strategies . . . . .	2-13
2.3-6 Acreage of Each Vegetation Management Technique -- Alternative 2 . . . . .	2-23
2.3-7 Acreage of Each Vegetation Management Technique -- Alternative 3 . . . . .	2-27
2.3-8 Acreage of Each Vegetation Management Technique -- Alternative 4 . . . . .	2-31
2.3-9 Acreage of Each Vegetation Management Technique -- Alternative 5 . . . . .	2-34
2.4-1 Estimated Costs for Each Alternative . . . . .	2-36
2.4-2 Breakdown of Initial Implementation Costs . . . . .	2-36
2.4-3 Breakdown of Operations and Maintenance Costs . . . . .	2-37
2.5-1 Summary of Effects on Key Issues . . . . .	2-38
3.3-1 Columbia River at Washougal, Washington, Mean Monthly Gauge Heights and Extremes . . . . .	3-9
3.3-2 Sandy River Below Bull Run River, Near Bull Run, Oregon . . . . .	3-9
3.4-1 Sensitive, Threatened, and Endangered Plant Species Potentially Occurring at the Sandy River Delta . . . . .	3-16
3.4-2 Habitat Types at Sandy River Delta . . . . .	3-18
3.4-3 Sensitive, Threatened, and Endangered Wildlife Species and Occurrence at the Sandy River Delta . . . . .	3-19
3.7-1 Recreation Use in Study Area Vicinity . . . . .	3-40
3.8-1 Viewpoints Description . . . . .	3-43
3.10-1 Federal and State Ambient Air Quality Standards . . . . .	3-49
3.11-1 Sound Levels Produced by Common Noise Sources . . . . .	3-53
3.11-2 Noise Measurement Data . . . . .	3-54

## LIST OF TABLES, Continued

	Page
4.2-1 Summary of Soils and Geology Effects . . . . .	4-8
4.3-1 Summary of Hydrology Effects . . . . .	4-21
4.4-1 Summary of Natural Resources Effects . . . . .	4-43
4.5-1 Summary of Cultural Resources Effects . . . . .	4-52
4.6-1 Summary of Land Uses and Planning Effects . . . . .	4-65
4.7-1 Summary of Recreation Effects . . . . .	4-75
4.8-1 Summary of Scenic Resources Effects . . . . .	4-84
4.9-1 Directional Probability of Gateway Facility Visitation . . . . .	4-85
4.9-2 Peak Hourly Volume of Gateway Facility Users . . . . .	4-86
4.9-3 2015 On-Site Recreation Trip Generation . . . . .	4-87
4.9-4 2015 Total Site Generated Traffic Volumes . . . . .	4-88
4.9-5 Estimated Ramp Levels of Service . . . . .	4-90
4.9-6 2015 Weaving Level of Service . . . . .	4-91
4.9-7 Summary of Transportation/Access Effects . . . . .	4-101
4.10-1 Predicted Local Carbon Monoxide Levels . . . . .	4-103
4.10-2 Summary of Air Quality Effects . . . . .	4-109
4.11-1 FHWA Roadway Noise Abatement Criteria . . . . .	4-111
4.11-2 Modelled LEQs for Existing Conditions and Alternatives 1-4 . . . . .	4-111
4.11-3 Typical Construction Equipment Noise (dBA) . . . . .	4-113
4.11-4 Summary of Noise Effects . . . . .	4-119
4.12-1 Summary of Utilities and Services Effects . . . . .	4-131
4.13-1 SCS Pesticide Database for Rodeo Herbicide . . . . .	4-134
4.13-2 SCS Soil Rating for Leaching and Runoff Potential . . . . .	4-135
4.13-3 Soil/Pesticide Interaction Rating . . . . .	4-135
4.13-4 Soil/Pesticide Interaction Rating for Rodeo on Delta Soils . . . . .	4-136
4.13-5 Summary of Potential Site Contamination Effects . . . . .	4-144

## LIST OF FIGURES

### Follows Page

1.2-1	Columbia River Gorge National Scenic Area	1-1
1.2-2	Vicinity Map	1-1
1.2-3	Land Ownership/Management	1-2
1.6-1	Recreation Intensity Classes	1-10
2.2-1	Interchange Option No. 1	2-3
2.2-2	Interchange Option No. 2	2-4
2.3-1	Alternative 1	2-4
2.3-2	Alternative 2	2-4
2.3-3	Alternative 3	2-4
2.3-4	Alternative 4	2-4
2.3-5	Alternative 5	2-4
2.3-6	Folded Diamond Interchange	2-4
2.3-7	Diamond Interchange	2-4
2.3-8	Typical Sections: Folded Diamond Interchange	2-4
2.3-9	Typical Sections: Diamond Interchange	2-4
2.3-10	Interim Access Plan	2-18
2.3-11	Alternative 2 Trail System	2-21
2.3-12	Alternative 3 Trail System	2-26
2.3-13	Alternative 4 Trail System	2-29
2.3-14	Alternative 5 Trail System	2-33
3.2-1	Soil Types (SCS)	3-1
3.3-1	Flood Hazard Areas	3-7
3.3-2	Representative Cross-Section	3-10
3.3-3	Wetlands	3-11
3.6-1	Existing Land Uses	3-29
3.6-2	Portland-Troutdale Airport Traffic Zone	3-30
3.6-3	Land Use Designations	3-31
3.8-1	Location of Viewpoints	3-42
3.8-2	Viewpoint 1	3-42
3.8-3	Viewpoint 2	3-42
3.8-4	Viewpoints 3 and 5	3-42
3.8-5	Viewpoint 4	3-42
3.9-1	Current Traffic Volumes on I-84/Jordan Road Interchange	3-45
3.10-1	Air Quality Receptor Locations	3-50

**LIST OF FIGURES, Continued**

	<b>Follows Page</b>
4.9-1 Alternative 1 2015 PM Peak Hour Traffic Volumes . . . . .	4-88
4.9-2 Alternative 2 2015 PM Peak Hour Traffic Volumes . . . . .	4-88
4.9-3 Alternative 3 2015 PM Peak Hour Traffic Volumes . . . . .	4-88
4.9-4 Alternative 4 2015 PM Peak Hour Traffic Volumes . . . . .	4-88
4.9-5 Alternative 5 2015 PM Peak Hour Traffic Volumes . . . . .	4-88
8.5-1 Section 4(f) and Section 6(f) Impacts of Alternatives 2, 3, and 5 . . . . .	8-2
8.5-2 Section 4(f) and Section 6(f) Impacts of Alternatives 2, 3, and 5 . . . . .	8-2





## **1.0 PURPOSE AND NEED FOR ACTION**

### **1.1 INTRODUCTION**

This Environmental Impact Statement (EIS) is being prepared in accordance with the National Environmental Policy Act (NEPA), as amended; NEPA Regulations (40 Code of Federal Regulations (CFR) Parts 1500-1508); the U.S. Department of Agriculture (USDA) Forest Service (FS) guidelines for implementing NEPA that are included in the Forest Service Manual (FSM) Chapter 1950 and Forest Service Handbook (FSH) 1909.15; the Notice, Comment, and Appeal Procedures for National Forest System Projects and Activities (36 CFR Part 217); U.S. Department of Transportation (USDOT) Federal Highway Administration (FHWA) procedures for complying with NEPA (23 CFR Part 771); Section 4(f) of the U.S. Department of Transportation Act (49 U.S.C. Section 303); Section 6(f) of the Land and Water Conservation Fund Act; Columbia River Gorge National Scenic Area Act (CRGNSA Act) (PL 99-663 Section 14(d)); and other related statutes and orders. The goal of the document is to provide a basis for comparing the alternatives developed for the Sandy River Delta and to disclose the environmental effects associated with each of the alternatives, to allow the decision-makers to make an informed decision regarding future management of the Sandy River Delta area.

The FS is the lead agency with primary responsibility for preparation of this EIS. The FHWA and U.S. Army Corps of Engineers (ACOE) are cooperating agencies in the preparation of this EIS. The Oregon Department of Transportation (ODOT) is representing FHWA interests in the EIS. The Oregon Division of State Lands (DSL), Oregon State Parks and Recreation Department (OPRD), Multnomah County, and other responsible agencies have also participated in the identification of issues and alternatives for the EIS.

Proposed actions addressed in this EIS include:

1. Selection and implementation of a Sandy River Delta Plan, and
2. Selection of a design for improvements to the Jordan Road interchange on Interstate 84 (I-84).

Alternatives for these proposed actions are presented in Chapter 2.0.

### **1.2 PROJECT AREA LOCATION AND DESCRIPTION**

As shown on Figure 1.2-1, the Sandy River Delta study area is located at the western end of the Columbia River Gorge National Scenic Area (NSA), adjacent to the Sandy River. Figure 1.2-2 presents the U.S. Department of the Interior, Geological Survey (USGS) map of the study area, which is located in Township 1 North, Range 3 East, Sections 13, 14, 24, and 25; and Township 1 North, Range 4 East, Section 18-20, 29, and 30.

The study area encompasses approximately 2,500 acres, including all land and water areas. As shown in Figure 1.2-2, it has been divided into four subareas for the purpose of discussion in this EIS. Each subarea and the owners or managers are shown on Figure 1.2-3 and described below.

### ***Sandy River Delta Subarea***

The Sandy River Delta, or "Delta" subarea, encompasses approximately 1,400 acres, excluding the mudflats and open water of the Sandy and Columbia rivers. The Delta encompasses two smaller subareas: Sun Dial Island and the Thousand Acres, which are divided by the original Sandy River channel. (The original channel was dammed in the 1930s; and the river was redirected into its existing location.) The Delta subarea also includes Gary, Flag and Chatham islands that lie east of the Thousand Acres subarea, and an unnamed island in the Sandy River west of the Thousand Acres.

Although the FS manages the majority of land in the Delta subarea, other agencies manage smaller portions. DSL manages all land below the mean high water line for the Sandy River, the old Sandy River channel, and the Oregon side of the Columbia River, as well as all lands that have been created by the natural action of these rivers, such as Chatham Island. Multnomah County owns Gary and Flag islands. The Bonneville Power Administration (BPA) and Northwest Pipeline Corporation (NWPC) have easements that cross the site, and the NWPC owns two small parcels (less than one acre each) at each end of the landing of their pipeline. The ACOE has a designated dredge disposal site (Site No. 10-122) along the north shore of the Delta.

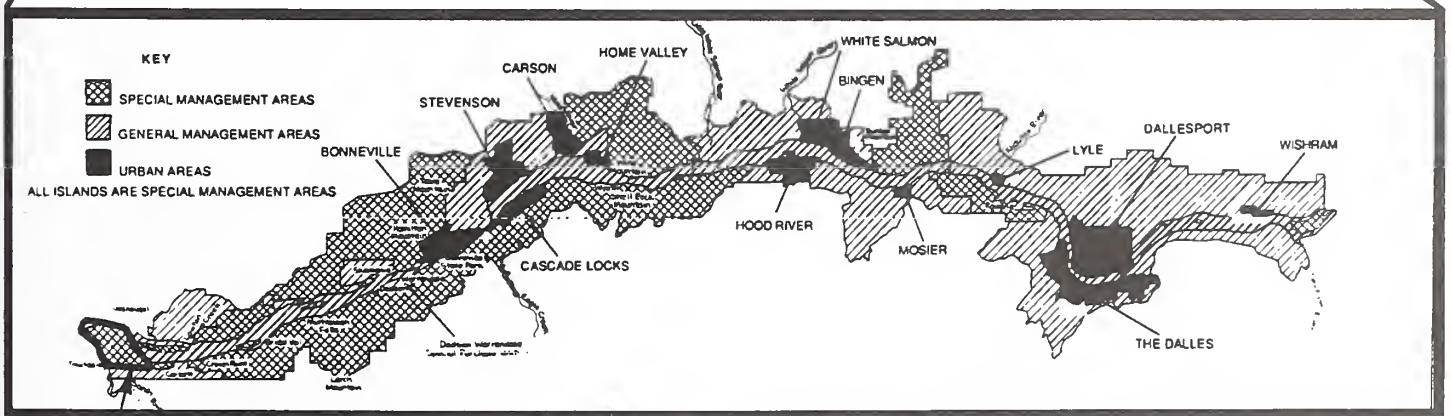
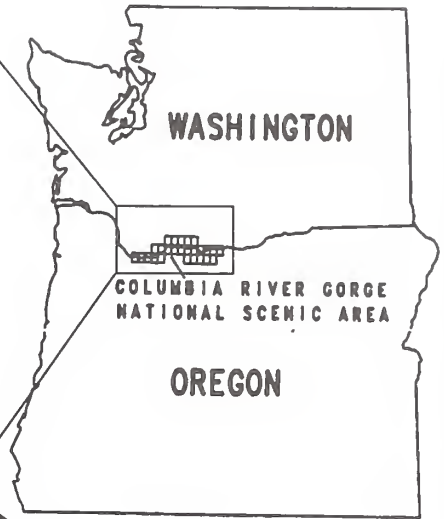
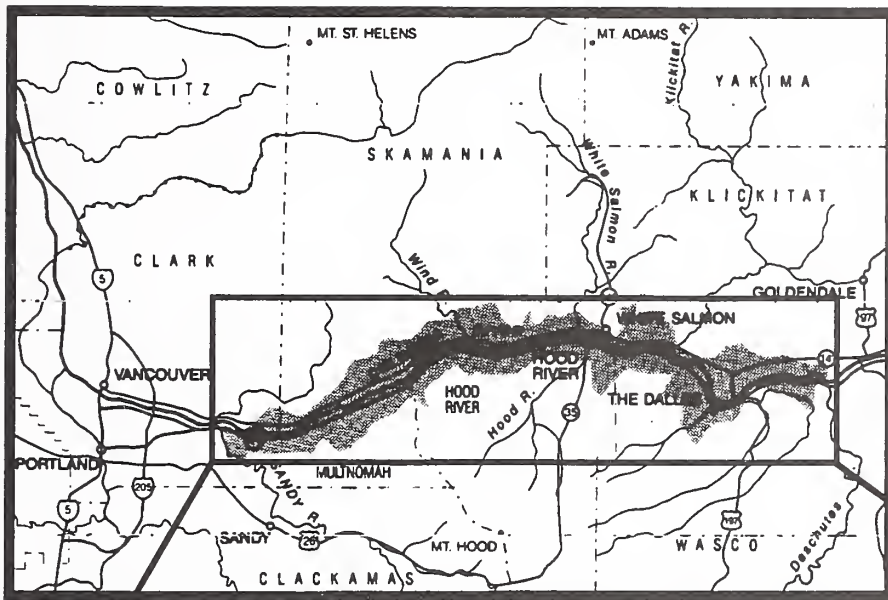
### ***ODOT Triangle Subarea***

The triangular portion of the study area that is bordered by I-84, the Union Pacific Railroad (UPRR) track and the Sandy River is referred to as the "ODOT Triangle" because it is primarily owned by ODOT. OPRD currently owns two parcels at the west end of the triangle, including a fenced gravel area that is used for overflow parking for Lewis and Clark State Park. OPRD manages the property below the mean high water line in the Sandy River, and UPRR owns the right-of-way along the railroad track. This subarea encompasses approximately 63 acres, excluding the Sandy River.

### ***Lewis and Clark State Park Subarea***

The area south of the UPRR track is primarily owned by the OPRD and lies within the Lewis and Clark State Park. This subarea reaches south to Broughton Bluff and west across the Sandy River. Other interests in the area include ODOT right-of-way for Jordan Road and the UPRR right-of-way along the railroad track.

Pacific Northwest Region



**SANDY RIVER  
DELTA AREA**

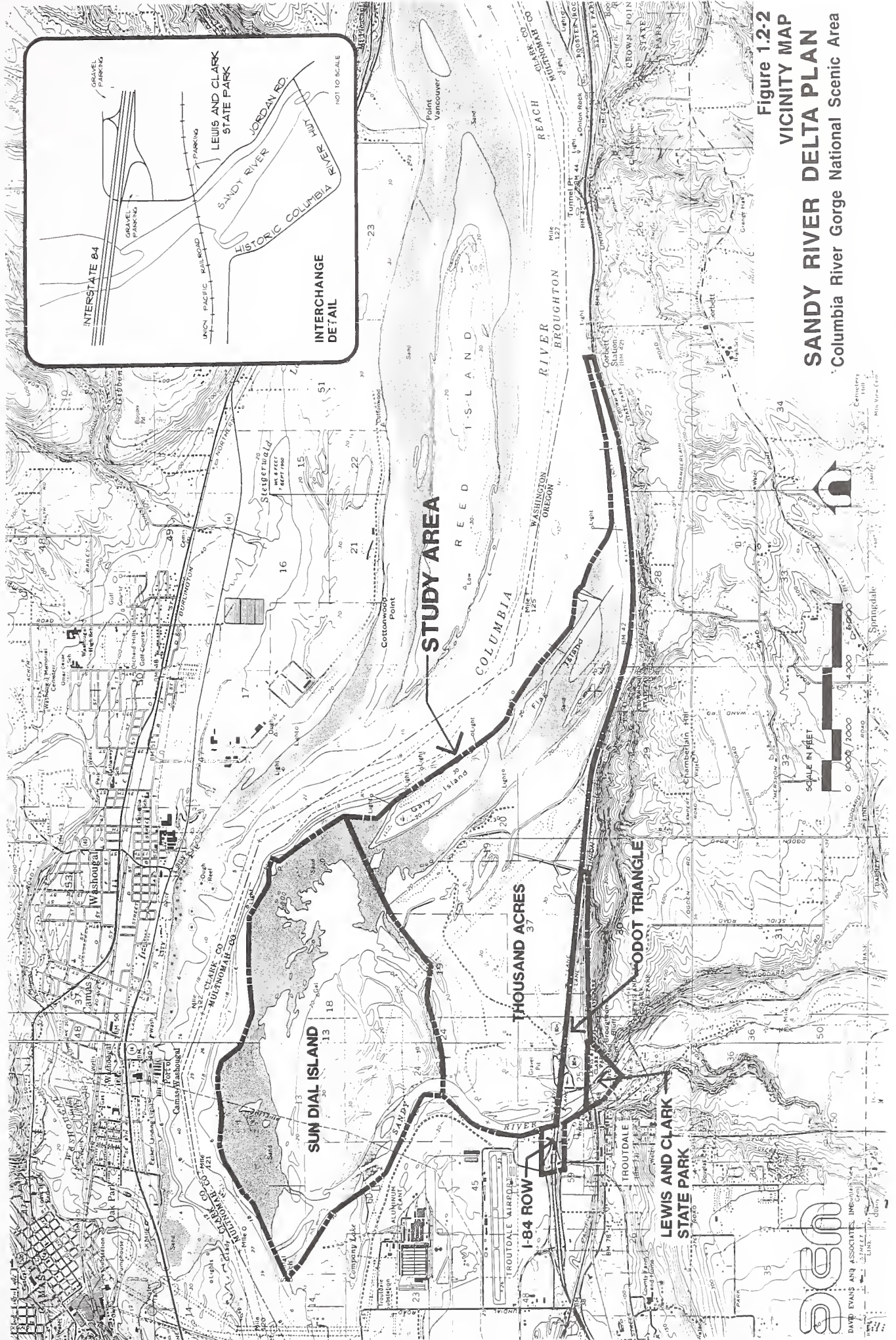
**Columbia River Gorge National Scenic Area**

**Figure 1.2-1**  
**REGIONAL LOCATION**  
**SANDY RIVER DELTA PLAN**  
**Columbia River Gorge National Scenic Area**





Figure 1.2-2  
VICINITY MAP  
**SANDY RIVER DELTA PLAN**  
Columbia River Gorge National Scenic Area



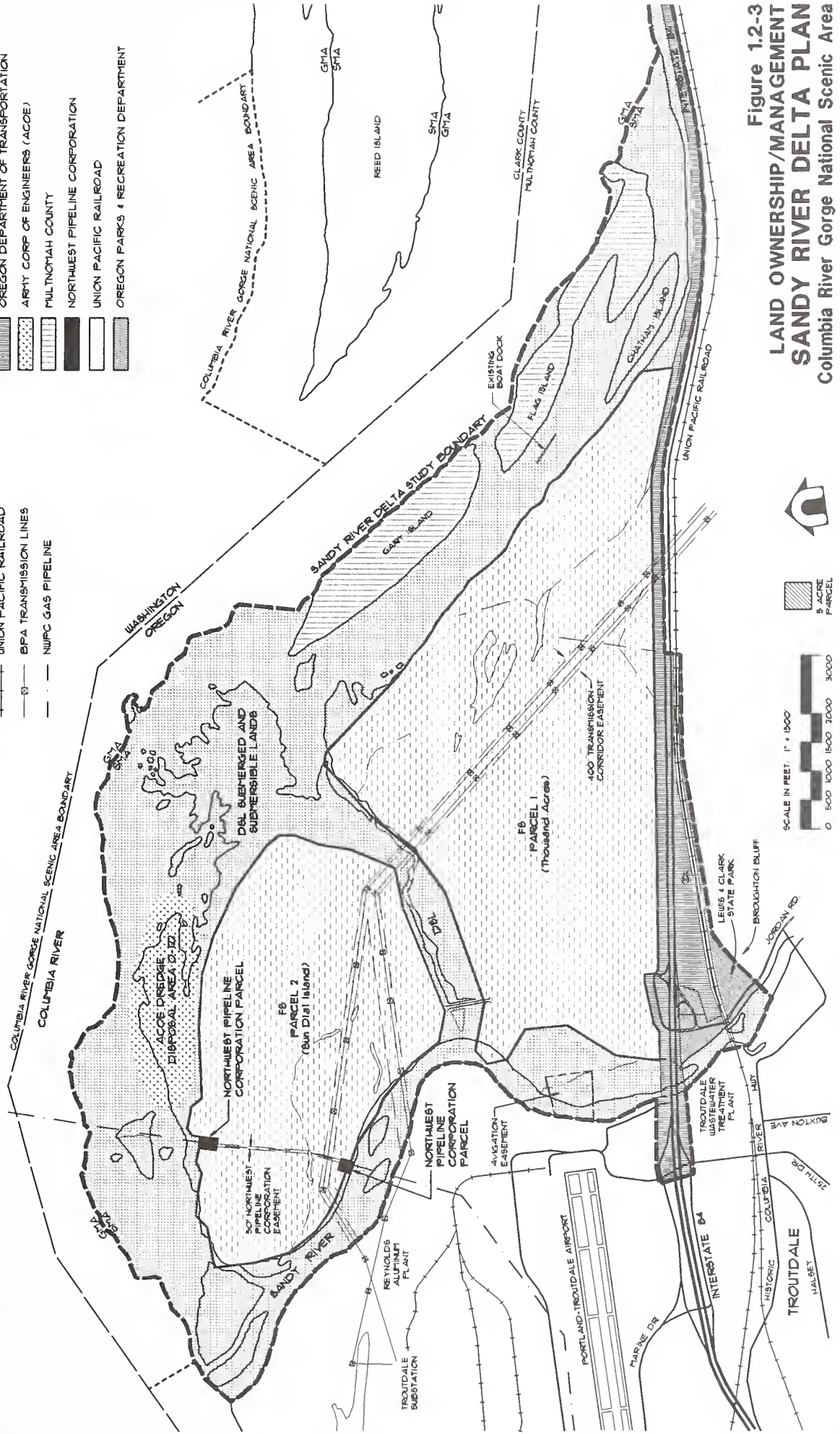




**LEGEND**

- SANDY RIVER DELTA STUDY BOUNDARY
- STATE BOUNDARY
- UNION PACIFIC RAILROAD
- BPA TRANSMISSION LINES
- NUPRC GAS PIPELINE

- USDA FOREST SERVICE (FS)
- OREGON DIVISION OF STATE LANDS (DSL)
- OREGON DEPARTMENT OF TRANSPORTATION
- ARMY CORP OF ENGINEERS (ACOE)
- MULTNOMAH COUNTY
- NORTHWEST PIPELINE CORPORATION
- UNION PACIFIC RAILROAD
- OREGON PARKS & RECREATION DEPARTMENT



**Figure 1.2-3**  
**LAND OWNERSHIP/MANAGEMENT**  
**SANDY RIVER DELTA PLAN**  
Columbia River Gorge National Scenic Area





### ***I-84 Right-of-Way Subarea***

The "I-84 right-of-way" extends approximately 100 feet on either side of the existing I-84 pavement from the west bank of the Sandy River to the eastern half of the Graham Road/NE 257th Drive interchange (the Troutdale interchange) with I-84. The portion of bridge that crosses the river is within unincorporated Multnomah County and is owned by ODOT. The area under the bridge that is submerged or submersible land is managed by DSL. The portion of ODOT right-of-way that lies west of the river is within the City of Troutdale and owned by ODOT.

## **1.3 PROPOSED ACTION**

The proposed action is to implement the goals and policies of the NSA Management Plan. Goals of the NSA Management Plan's Open Space, Public Recreation and Recreation Development plans that are applicable to the Sandy River Delta portion of the NSA are presented below. Implementing policies, standards, and guidelines are described where applicable in Chapter 3, Affected Environment.

### ***Open Space***

**Open Space Special Management Area (SMA) Goal.** *To protect and enhance open space values. This is done through the development of an Open Space Plan to provide direction for resource protection, enhancement, and management.*

### ***Public Recreation***

**Public Recreation SMA Goal.** *Protect and enhance lands that are suitable for public recreation.*

### ***Recreation Development Plan***

**Recreation Development Plan SMA Goal 1.** *Provide opportunities for public and private recreation use and access to the Columbia River.*

**Recreation Development Plan SMA Goal 2.** *Provide a diversity of trail opportunities in the National Scenic Area.*

**Recreation Development Plan SMA Goal 3.** *Increase public awareness, understanding, and appreciation of the scenic, natural, cultural, economic, and recreational resources of the Scenic Area.*

**Recreation Development Plan SMA Goal 4.** This goal relates to the Historic Columbia River Highway and is not applicable to the proposed action.

**Recreation Development Plan SMA Goal 5.** *Maximize customer service and cost-effectiveness of recreation opportunities by using partnerships of user groups and recreation providers to design and construct recreation facilities.*

The Recreation Development Plan outlines specific proposals for a "western gateway" and trails to be located in the Sandy River Delta portion of the SMA. These proposals were the basis of the alternatives developed for the Sandy River Delta. It is a FS objective to develop the facilities identified in the Recreation Development Plan in a manner that best meets the goals for protecting and enhancing the scenic, cultural, recreational, and natural resources in the study area. The specific gateway and trail proposals identified in the NSA Management Plan's Recreation Development Plan are presented below. Only the western gateway (No. 45), trail No. T28, and the western terminus of trail No. T27 are being planned at this time.

**No. 45 -- Western Gateway. Development Proposal:** *The site would serve as the southwest orientation and information gateway to the Columbia River Gorge. Facilities for picnicking, hiking, fishing access, and interpretation would be developed. The approximate design capacity is 350 to 500 persons at one time.*

*Facilities would be mostly designed for the comfort and convenience of the users. Synthetic materials could be used in construction. Provision of emergency, law enforcement, and fire services is a major concern for this site and would have to be included.*

Trail No. 28 would be located mostly on the Delta portion of the study area, and would provide a pastoral and riverfront setting with many fine views and opportunities for interpretation.

**No. T28 -- Sandy River Delta Trail. Development Proposal:** *This would be part of a hiking trail system that provides opportunities for scenic appreciation and interpretation facilities. Four miles of new trail would be constructed.*

Trail No. 27 is located east of the study area on land primarily in private ownership, and would connect to the Sandy River Delta Trail. As noted above, only connection to the western terminus of this trail at Lewis and Clark State Park is being considered in the planning for the Sandy River Delta.

**No. T27 -- Lewis and Clark State Park to Corbett Station Trail. Development Proposal:** *Four miles of new trail are proposed to provide opportunities for hiking and scenic appreciation. There is an existing trailhead opportunity at Lewis and Clark State Park; a parking area is proposed at the existing borrow pit at Corbett Station in the GMA. Some sections of the trail traverse steep bluff lands and would require sophisticated design and construction.*

### 1.3.1 Related Agencies' Actions

ODOT's primary objectives are to:

1. Formulate and develop interchange options that (with the addition of the gateway) will maintain the traffic flow and safety of motor vehicle movements in the study area through the year 2015. (Note that this assumes construction will occur in 1995. This was done for analysis purposes; the actual construction date has not been determined.)
2. Avoid interchange options that are contrary to current FHWA policy and American Association of State Highway and Transportation Officials (AASHTO) standards.
3. Maintain a minimum roadway elevation of 30 feet to accommodate a 50-year storm.

Modification of the Jordan interchange is not currently a high-priority ODOT project, although the interchange is recognized by ODOT as being a substandard interchange. Future modifications to the interchange could affect the location of a gateway and access to the study area and Lewis and Clark State Park. These actions should be considered together as part of the proposed action. It is appropriate to evaluate and select an alternative or alternatives for the interchange that would provide for safe and adequate access to the area at the time it becomes a priority project. In addition, joint planning can include consideration of a possible future connection between the 40-Mile Loop Trail west of the Sandy River and the trail system in the Columbia River Gorge NSA, as well as the possible realignment of Jordan Road to improve access to the Sandy River from Lewis and Clark State Park.

In 1992 and 1993, OPRD prepared a *Columbia Gorge District Master Plan* (OPRD, 1993) for the development and management of OPRD facilities in the Columbia Gorge. The plan acknowledges FS plans to develop the "western gateway" to the NSA, and the possible need for ODOT to modify the Jordan interchange. Based on the plan, OPRD's primary objectives for the Sandy Delta area and Lewis and Clark State Park are:

1. To maintain the same level of recreational parking currently available in OPRD parking areas.
2. To improve access to the Columbia and Sandy rivers for recreational uses.
3. To support development of intermodal transportation opportunities for Gorge visitors, including a park-and-ride facility.
4. To provide a public phone at the existing Lewis and Clark State Park paved parking lot.

This EIS will address the first two objectives of the OPRD plan. The latter two are outside the scope of this EIS.

DSL manages state land to generate revenue for state operations, consistent with protection of natural resources on the site and state land use law. DSL land on the Sandy River Delta is below the ordinary high water mark of the Sandy and Columbia rivers and the old Sandy River channel. DSL objectives for management of these areas are to protect in-stream resources and riparian wetlands values.

Multnomah County owns Gary and Flag islands on the eastern edge of the planning area. The County objectives for management of the islands are (1) to provide for river recreation which is (2) consistent with the protection of sensitive natural resources of the river environment.

## **1.4 PURPOSE AND NEED**

### **1.4.1 Sandy River Delta Plan**

Plans to manage the open space, recreation and vegetation resources in the Delta are called for in the NSA Management Plan. The reasons these plans are needed are presented below.

1. An Open Space Plan is required by the NSA Management Plan to set direction for resource protection, enhancement, and management.
2. Previous agricultural uses and management of the site have removed native (predominantly riparian forest) vegetation and introduced noxious weeds and invasive non-native species. There is a need for a vegetation management strategy consistent with the NSA Management Plan and the Mediated Agreement on Managing Competing and Unwanted Vegetation to set direction for future management, including landscape enhancement.
3. The Delta receives substantial informal recreational use, including: hiking, camping, bicycling, horseback riding, fishing, boating, and hunting. However, there are no facilities (sanitary, trash, improved trails, fire pits, signage, caretaker, disabled access, etc.) to manage and support this use. There is a need to develop a management strategy and facilities to accommodate recreational use of the Delta.
4. The majority of users of the Columbia River Gorge NSA originate from the Portland/Vancouver metropolitan area. This site is on the main access route to the NSA from Portland (I-84). The NSA Management Plan identified the need for a gateway facility that orients and educates visitors about the NSA as they enter the area from the west.



5. Columbia River flood plain habitat has been lost due to development and construction of dams. The areas that remain have been cleared and degraded by agricultural use. There is a need to protect, enhance, and restore this habitat and the species that depend on it. In addition, this habitat would provide flood water storage, preventing downstream flood damage. There is a need to establish guidelines to protect, enhance, and restore the flood plain habitat.

#### **1.4.2 Jordan Interchange Modification**

Modifications to the Jordan interchange are needed for the following reasons:

1. The interchange does not meet current AASHTO design standards: there is inadequate (substandard) distance between the Jordan interchange and the Troutdale interchange which creates unsafe weaving vehicle movements between the two interchanges, especially for large commercial trucks. Widening I-84 and the I-84 bridges over the Sandy River, is needed to provide an auxiliary lane in each direction between the two interchanges.
2. The turning radii of the on and off ramps are smaller than current ODOT standards, creating substandard conditions for vehicles exiting and entering the highway at this interchange.
3. Access to the Delta property is currently located on the north on/off ramp, creating a conflict between site traffic and freeway traffic. Access to the Delta must be relocated.
4. The vertical and horizontal clearance of Jordan Road under I-84 is inadequate and the road is below the 50-year flood elevation.
5. There is inadequate sight distance and vertical clearance for Jordan Road under the UPRR.
6. All of the above problems would be exacerbated by additional traffic destined for the Delta and gateway facility.
7. The gateway facility needs to be located so that it is not in conflict with future interchange modifications.

### **1.4.3 Lewis and Clark State Park Parking and River Access**

Lewis and Clark State Park currently has a paved lot with 125 parking spaces and an undeveloped gravel area north of the UPRR track that can accommodate approximately 175 additional vehicles. The NSA Management Plan has placed a ceiling on the amount of parking allowed within the area of the Delta designated as recreation intensity class (RIC) 4, which includes the park. Under the plan, the maximum design capacity for parking areas is 250. However, another ten percent, for a total of 275 spaces, is allowed if enhancement or mitigation measures for scenic, cultural, or natural resources are approved for 20 percent of the site. Facilities located less than 0.25 mile apart are counted together in calculating the parking permitted.

Multnomah County ordinances implementing the NSA Management Plan limit the parking in the RIC 4 area to 200 cars, with no variances permitted. This ordinance would apply only to non-federal lands in the study area. Depending on where the gateway may be located, OPRD desires the FS to provide additional parking north of I-84, or to share parking with Lewis and Clark State Park, in order to maintain sufficient parking to accommodate peak park usage after gateway improvements.

Jordan Road may be moved to a location closer to Broughton Bluff. This would improve access between the park and the Sandy River. However, it would also potentially separate the park from Broughton Bluff and the head of the Lower Elevation Gorge Trail. Facilities (e.g., designated crosswalk) and/or signage to protect the safety of pedestrians traveling from the park to the bluff are needed.

## **1.5 DECISIONS TO BE MADE**

The Sandy River Delta Plan will provide the following direction for the Delta and adjacent areas:

### **1.5.1 Programmatic**

Selection and implementation of a Sandy River Delta Plan, including:

- vegetation management strategies to achieve the desired future landscape condition,
- recreation management strategies to minimize conflicts among users and protect natural resources, and
- a monitoring program to ensure that plan objectives are achieved.

### 1.5.2 Site-Specific

Selection of

- a design for improvements to the Jordan Road interchange on I-84.
- the type and site of a western gateway to the NSA, including gateway size and functions, and support facilities (parking, restrooms, picnic areas, etc.).
- the type and location of recreation facilities, including trails, river access, picnic areas, etc.
- specific vegetation management techniques for specific areas.

## **1.6 PLANNING FOR THE PROJECT AREA**

NSA policy requires proposed plans for the project area to be consistent with other plans adopted by federal, state, and local agencies with jurisdiction. These agencies include FS, ODOT, OPRD, U.S. Department of the Interior, Multnomah County, and the City of Troutdale. In addition, FS and Bureau of Land Management (BLM) land management policies must be consistent with the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (The President's Plan and the ROD for the President's Plan). This section describes the legislative and regulatory framework for the relevant planning activities and plans.

### **1.6.1 Columbia River Gorge NSA Act**

In 1986, Congress passed the CRGNSA Act (Public Law 99-663). There are two primary purposes of the Act:

1. *To establish a national scenic area to protect and provide for the enhancement of the scenic, cultural, recreational, and natural resources of the Columbia River Gorge; and*
2. *To protect and support the economy of the Columbia River Gorge area by encouraging growth to occur in existing urban areas and by allowing future economic development in a manner that is consistent with paragraph 1.*

As shown on Figure 1.2-1, the NSA covers portions of six counties and stretches about 83 miles from the Sandy River on the west to the Deschutes River on the east in Oregon, and from Gibbons Creek in Clark County to a line four miles east of Wishram in Washington. To

achieve the purposes of the Act, Congress called for preparation of a NSA Management Plan that would treat the two-state, six-county area as a region. Congress divided responsibility between the FS and the Columbia River Gorge Commission (CRGC), a regional commission representing local, state and national interests. The six counties in the NSA were authorized to implement the NSA Management Plan through their land use ordinances.

### **1.6.2 Columbia River Gorge NSA Management Plan**

The *Management Plan for the Columbia River Gorge National Scenic Area* (herein referred to as the "NSA Management Plan") was adopted by the CRGC on October 15, 1991, and the U.S. Secretary of Agriculture concurred with the plan on February 13, 1992.

To facilitate preparation of the NSA Management Plan, Congress divided the NSA into three categories of land: (1) Urban Areas, (2) the General Management Area (GMA) and (3) the Special Management Area (SMA). The Urban Areas are exempt from the NSA Management Plan.

The GMA covers approximately 149,000 acres and includes most of the Columbia River. The GMA covers most of the eastern part of the Gorge and is also scattered in the central and west portions of the Gorge. Land in the GMA is predominantly devoted to agricultural and forestry uses, but also contains scattered areas of residential development. The CRGC prepared the Management Plan land use designations and guidelines for the GMA.

The SMA covers approximately 115,100 acres of the region's most sensitive lands, concentrated primarily in the western half of the NSA. The FS was directed to prepare land use designations and guidelines for the SMA consistent with the intent of the Columbia River Gorge NSA Act. It was also given authority to purchase lands, or interests in lands, in the SMA, and the opportunity to exchange federal lands elsewhere for privately held forest lands within SMA boundaries.

The portion of the study area that lies in and east of the Sandy River (including the islands) is within the SMA. (The portion of the study area that lies west of the Sandy River is outside the NSA.) The NSA management plan designates the landscape setting for the study area within the NSA as "River Bottomlands." The land use designation for approximately 200 acres of the study area is "Public Recreation," and the remainder is "Open Space."

As shown in Figure 1.6-1, the NSA Management Plan applies three recreation intensity classes to the study area: RIC 1 (very low intensity) covers most of the area, and RIC 2 (low intensity) covers the Sandy River and a portion of the Columbia River, as well as an area of the Thousand Acres subarea. Both RIC 1 and RIC 2 emphasize provision of "semi-primitive recreation" opportunities, and apply to the area designated for Open Space land uses. RIC 4, the most intense recreation management class, applies to the same area as is designated for Public Recreation.





DAVID EVANS AND ASSOCIATES, INC.

RECREATION INTENSITY CLASS (RIC)  
ADOPTED IN ORGSA MANAGEMENT PLAN

## LEGEND

- |  |  |  |                               |
|--|--|--|-------------------------------|
|  | SANDY RIVER DELTA STUDY BOUNDARY       |  | SANDBAR AREA (USGS)           |
|  | GATEWAY SITE (RIC4, PUBLIC RECREATION) |  | OPEN WATER (USGS)             |
|  | STATE BOUNDARY                         |  | VERY LOW INTENSITY RECREATION |
|  | UNION PACIFIC RAILROAD                 |  | LOW INTENSITY RECREATION      |
|  | BPA TRANSMISSION LINES                 |  | HIGH INTENSITY RECREATION     |
|  | GAS PIPELINE                           |  |                               |

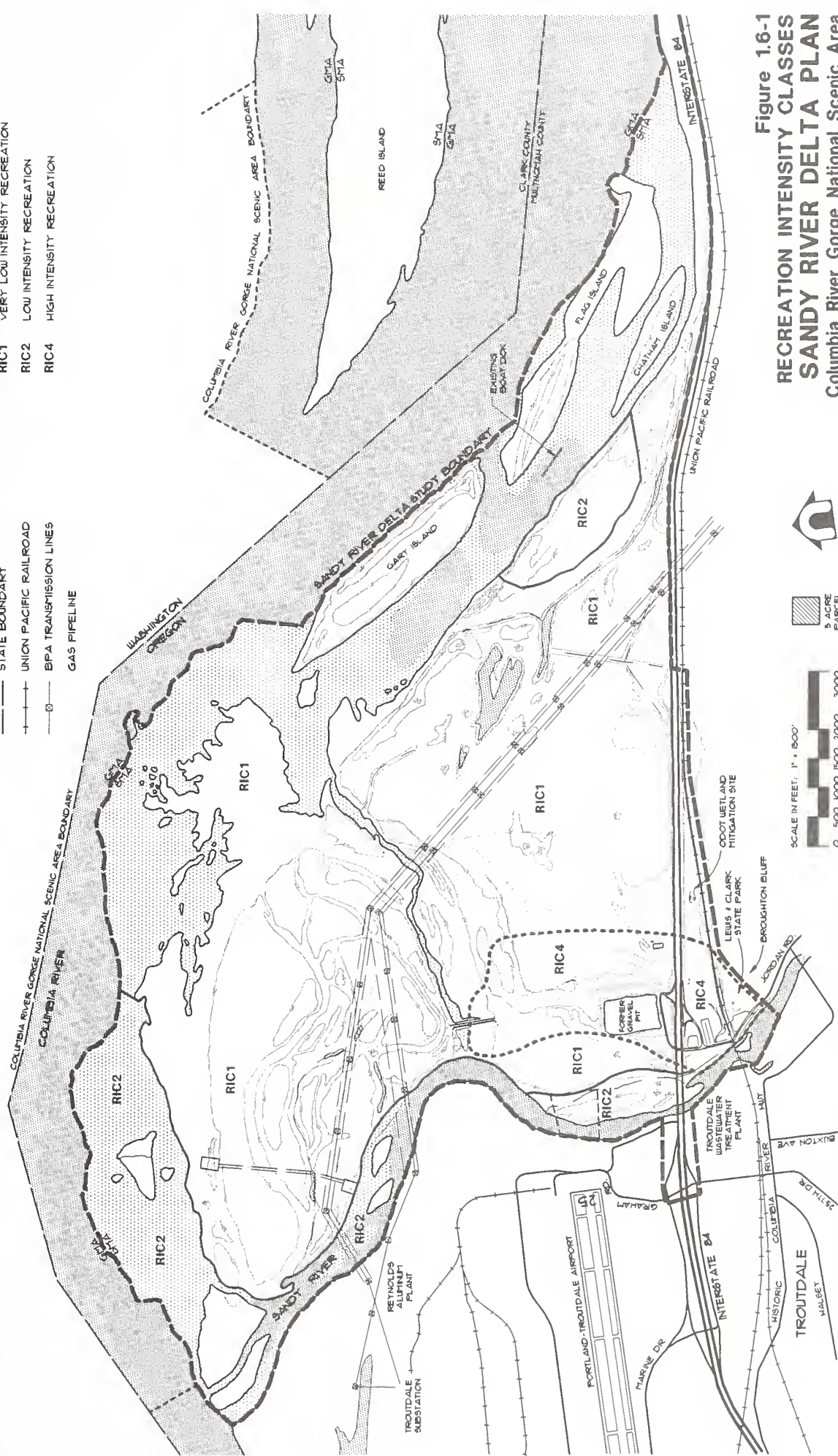


Figure 1.6-1  
RECREATION INTENSITY CLASSES  
SANDY RIVER DELTA PLAN  
Columbia River Gorge National Scenic Area



The Recreation Development Plan of the NSA Management Plan specifies that facilities for picnicking, hiking, fishing access and interpretation may be developed in the study area. The design capacity of the Public Recreation/RIC 4 area where the western gateway is located is limited to 350 to 500 persons at one time (PAOT). In addition, the Recreation Development Plan envisions development of a trail around the site, including possible trail connections to Lewis and Clark State Park, and the 40-Mile Loop and Lower Elevation Gorge trails. Approximately four miles of new trail are to be constructed according to the Recreation Development Plan.

The NSA Management Plan identifies the SMA goal for Open Space areas to, "Protect and enhance open space values," and has identified policies to provide special protection for sensitive scenic, cultural, recreational and natural resources.

### **1.6.3 Mt. Hood National Forest Plan**

National Forest land in the NSA is included in the Mt. Hood National Forest (Oregon) or the Gifford Pinchot National Forest (Washington). The forest-wide standards and guidelines of the *Land and Resource Management Plan for the Mt. Hood National Forest* (Forest Plan) apply to National Forest land on the Sandy River Delta. The *Columbia River Gorge National Scenic Area Management Plan User's Guide for National Forest Lands* (User's Guide) provides direction for implementation of the Forest Plan and NSA Management Plan, when the provisions overlap. In general, the more restrictive standards or policies apply.

Forest-wide standards and guidelines which apply to the Sandy River Delta include those related to soil productivity; air quality; water quality; riparian areas; fisheries; forest diversity; threatened, endangered, and sensitive plants and animals; wildlife; forest protection and public safety; transportation systems/facilities; travel and access; dispersed recreation; visual resource management; cultural resources management; human rights; special uses; and special forest products.

### **1.6.4 President's Plan**

In 1993, President Clinton directed an interagency task force (the forest ecosystem management assessment team, or FEMAT) to identify management alternatives to resolve on-going disputes about the management of federal forest lands in the range of the northern spotted owl that would comply with existing laws, take an ecosystem approach to managing for biological diversity, and produce the highest contribution to economic and social well being. This plan applies to over 24 million acres of public land managed by the FS and BLM within the range of the northern spotted owl, including Mt. Hood National Forest land. The President's Plan (1993) and the subsequent ROD for the President's Plan (FS and BLM, 1994) apply to the Sandy River Delta.



Adopted along with the President's Plan were *Standards and Guidelines for Management of Habitat for Late-Successional and Old Growth Forest-Related Species within the Range of the Northern Spotted Owl* (FS and BLM, 1994). Specific standards and guidelines which apply to the project area include those for "Matrix" forests and "Riparian Reserve" areas. Because most of the trees on Sandy River Delta were cleared earlier in the century for agriculture, the standards and guidelines related to forest management are less pertinent than those related to riparian areas, including 100-year flood plains. The Aquatic Conservation Strategy Objectives contained in the President's Plan require that the site be managed to:

1. *Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.*
2. *Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include flood plains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.*
3. *Maintain and restore the physical integrity of the aquatic system, including shorelines, banks and bottom configurations.*
4. *Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.*
5. *Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.*
6. *Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.*
7. *Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.*

8. *Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.*
9. *Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.*

A watershed analysis, to determine how a proposed action complies with the Aquatic Conservation Strategies, is required for the proposed Open Space and Management plans to be developed for the study area. The watershed analysis prepared by FS staff is included in the project analysis file. This analysis found a loss of riparian forest, wetlands, and open habitat in the analysis area, and the potential loss of connectivity over time. Eight objectives for management of the area were identified to achieve the Aquatic Conservation Strategy Objectives.

1. Maintain or restore the range of natural conditions in a viable state;
2. Maintain or restore habitats that have been most reduced and/or degraded (i.e., riparian forest, wetlands and native open habitat);
3. Coordinate efforts to increase the viability of targeted species groups such as migratory waterfowl;
4. Recreate natural hydrological effects, where possible, to counter the change from the range of natural variability created by channelization;
5. Encourage natural fluvial processes including deposition and erosion;
6. Allow recreation use compatible with resource goals;
7. Promote landscapes of diverse or rare scenic quality; and,
8. Protect cultural and historic resources.

#### **1.6.5 OPRD Columbia Gorge District Parks Master Plan**

OPRD recently revised the Master Plan for the Columbia River Gorge District facilities to reflect the goals and policies of the CRGNSA Act. The following objectives guided the development of recommendations for facility expansion and management in the Gorge:

1. **Provide additional recreational opportunities:** Provide for those activities which have been identified in the recreation needs and opportunities analysis as fitting OPRD's role in the Gorge and which can be accommodated on existing or future OPRD lands within resource and development constraints:
  - Provide for increased recreational access to the Columbia River where suitable and feasible;
  - Provide multiple recreation activities at each park to the extent possible, with given opportunities and development constraints;
  - Devote popular riverside lands to day-use and active recreational activities, while providing support facilities and overnight camping;
  - Provide additional trailheads and trail connections where needed and within OPRD's role as a provider in the Gorge;
  - Consolidate land ownerships and pursue land trades where needed to provide efficient management of public lands.
2. **Social diversification:** Improve access to recreation sites for a broader sector of the public, based on differences in physical and mental abilities, ethnic or cultural background, or income level.
3. **Buffers:** Identify adjacent lands which need to be acquired to protect resources and uses within OPRD lands or to protect an adjacent resource which contributes to the enjoyment of the park.
4. **Areas of concern:** Identify adjacent or nearby lands which provide important buffers or recreational access under current zoning or ownership. Monitor for potential future acquisition if zoning or land use changes so as to threaten park resources or change important recreation access.
5. **Natural resource protection:** Identify areas needing OPRD protection, special management techniques, and/or enhancement for long-term quality and diversity, and to provide public enjoyment and understanding.
6. **Visual resource protection:** Retain ownership of OPRD lands which were acquired or donated for scenic protection before the creation of the NSA.
7. **Cultural resource protection:** Protect and preserve known significant cultural sites. Perform surveys on OPRD lands per the NSA Management Plan cultural resource guidelines. Monitor known statewide or regionally significant cultural resources outside of OPRD lands for possible threats and evaluate for acquisition on a case-by-case basis.

### **1.6.6 Planning for the Sandy River Delta**

In 1991, the FS acquired much of the acreage north of I-84 on the Delta. An Interim Management Plan for this property was adopted in April 1991. It specifies that the site will be managed for low-impact, dispersed recreation and watchable wildlife. Biological controls will be used for noxious weeds and mosquitoes, in cooperation with state and local jurisdictions. The Interim Management Plan will remain in effect until a new Management Plan for the area is adopted.

At that time, the process was initiated for developing an Open Space Plan for the entire study area as required by the NSA Management Plan. The Sandy River Delta Natural Resources Inventory was completed by Salix and Associates in August 1992.

Extensive and ongoing public involvement has been, and continues to be, an integral part of the planning process for the Sandy River Delta. Since 1992, a variety of opportunities have been provided to the public and interested and responsible agencies to participate in the development of land use and management alternatives for the study area. The public involvement process is described in Section 1.7, below.

In February 1993, the Notice of Intent to prepare the EIS for the long-term Delta Management Plan was published. In April 1993, a preliminary range of five alternatives had been developed and made available to the public and interested and responsible agencies for review and scoping.

### **1.6.7 Jordan Road Interchange with I-84**

After public review of the preliminary range of alternatives, it became apparent that any development of the Sandy River Delta would require alterations to the existing Jordan Road interchange with I-84. In addition, commentors suggested that the land south of I-84 would be more appropriate for the gateway facility than National Forest land north of I-84 since it is more visible from eastbound I-84, more convenient to access for the eastbound traveler, and would reduce development on the north side of I-84. ODOT expressed interest in joining the FS in preparing the plans and EIS to ensure that any future gateway location south of I-84 would not conflict with future interchange modifications. ODOT expressed willingness to have the gateway located on excess ODOT property, but the determination of what property would be "excess" can only be made after designs for a modified interchange are selected.

Inclusion of the interchange redesign and bridge widening required an expansion of the study area to include the area owned by ODOT south of I-84. Because the interchange is so close to the Troutdale interchange, there are concerns about adequate weave length between the two interchanges. Therefore, the study area was enlarged to include the area along I-84 to the Troutdale interchange. Because some preliminary alternatives suggested that Jordan Road



should be realigned along Broughton Bluff, within Lewis and Clark State Park, the study area was expanded to include this area.

The inclusion of the interchange redesign offered opportunities to address issues raised during the initial scoping process (December 1992 to April 1993), prepare a more comprehensive/integrated plan for the area, and save public funds by addressing both projects in one EIS.

## **1.7 PUBLIC INVOLVEMENT**

Extensive and ongoing public and agency involvement has been an integral part of the Sandy River Delta planning process. Public involvement activities during preparation of this draft EIS were conducted pursuant to a public/agency involvement program approved by the FS. This program and other public involvement reports are included in the project analysis file and available for public review at the Columbia River Gorge NSA office in Hood River. As part of that program, three groups were identified for public/agency involvement purposes:

1. Agencies with direct land management or ownership authority in the project (including FS, ODOT, OPRD, DSL, ACOE, Multnomah County, and the City of Troutdale).
2. Other federal, state and local agencies, including FHWA, BLM, USDOT Federal Aviation Administration (FAA), U.S. Department of Interior, Fish and Wildlife Service (USFWS), U.S. Coast Guard, U.S. Department of Energy Bonneville Power Administration (BPA), Oregon Department of Water Resources (DWR), Oregon Department of Fish and Wildlife (ODFW), Oregon Department of Environmental Quality (DEQ), State Marine Board, Multnomah County, City of Troutdale, and Port of Portland, with regulatory authority over some aspect of potential uses of the site.
3. Other agencies, public interest groups and individuals that have expressed interest and concerns regarding land uses and resources in the Columbia River Gorge NSA.

NEPA establishes scoping as an integral and ongoing element of environmental analysis. A primary purpose of scoping is to identify the issues to be addressed and the depth of analysis required for the EIS. Scoping for this project occurred in two phases.

The initial scoping process (November 1992 to April 1993) began with news releases about the initiation of the project. Activities included two newsletters, two site tours, an open house, a design charrette, and two interagency scoping meetings. Through these contacts, a list of preliminary issues, site suitability opportunities and constraints, and a range of preliminary alternatives were developed and presented to the public.

The second phase of scoping began after the project was expanded to include the interchange design and took place from May 1993 to May 1994. Activities included a third newsletter, an



open house, and site tours. During this time, issues related to the interchange were identified, and interchange design options were developed and presented to agencies and the public.

During the scoping process, over 20 public presentations and site tours were offered to agencies, interest groups, civic organizations, and the public.

## **1.8    SIGNIFICANT ISSUES**

NEPA directs federal agencies to focus analysis and documentation on the significant issues related to a proposed action. The scoping process resulted in the identification of a wide variety of potential issues and concerns to be addressed in the EIS. These were condensed and consolidated into a list of significant issues in major topic areas, which were then reviewed in public meetings and by the agency advisory subgroup, the interagency task force, and the FS interdisciplinary team (IDT) to identify the most significant issues.

The EIS focuses on the significant issues listed below. However, all the issues and concerns identified through scoping have been considered in the development and analysis of alternatives. A comprehensive list of scoping issues is available for review as part of the project analysis file at the Columbia River Gorge NSA office in Hood River.

### ***1.    Traffic/Circulation/Access***

- What improvements to I-84 and Jordan Road will be needed to improve safety and provide access to the site and how will they affect threatened and endangered species, historic resources, and Lewis and Clark State Park?
- How will access to open space portions of the site be controlled to ensure that SMA standards are not exceeded?
- How will river access (both Sandy and Columbia rivers) be provided and riparian habitat protected?
- What will be the impact of the proposed project on parking for Lewis and Clark State Park? How will conflicts with parking between the park and the gateway be resolved?

### ***2.    Size/Location of Gateway Facilities***

- Where should the gateway be located?
- What functions should the gateway facility incorporate?
- How will gateway usage be controlled to meet NSA Management Plan standards?

3. *Recreational Uses and Development*

- Can the recreational needs of an urban population be accommodated while preserving the site's natural setting and resource values?
- How will existing and new recreation uses be managed to reduce/avoid conflicts among users?
- Will the Jordan Road realignment affect the Lewis and Clark State Park boat ramp or its access?
- How will access to the Broughton Bluff climbing area and Gorge trails be affected?

4. *Public Safety/Control of Illegal Uses*

- What measures will be instituted to control illegal uses and the effects of increased recreation use -- litter, vandalism, trespass, safety, parking, human waste, noise, etc.
- What will be the impacts of development on agencies that provide fire and emergency services to the site?

5. *Restoring/Maintaining Natural Hydrologic Regimes*

- What measures are needed to control channel meandering, erosion/bank stability, riparian habitat health?
- Should the historic dike be breached to restore original stream channels? What effects would its removal/breaching have on wetlands, riparian areas, and fish and wildlife habitat?
- What effects will water drawdowns from Columbia River dams have on the habitat restoration of the site?
- What effects will discharges from the Troutdale sewage treatment plant have on proposed recreational use of the Sandy River frontage?
- Will realignment of Jordan Road under the railroad have adverse effects on groundwater?
- What are the effects on wetlands and riparian habitat from I-84 widening, new bridge or widening construction, or relocated boat ramp access?

6. *Landscape Restoration/Enhancement*

- What landscape pattern/habitat types should be created/restored?
- How will wetlands be protected from increased access and new recreational uses?
- What are the effects of invasive species on native plant communities? On threatened and endangered species (both plants and animals)?

- What will be the effects of proposed measures to control noxious weeds/invasive species on native plant communities? On wildlife? On threatened and endangered species (both plants and animals)?

**7. *Fish and Wildlife Habitat Restoration/Enhancement***

- Which species should the site be managed for?
- What will be the impact on fish and wildlife habitat from increased access and new recreational uses?
- Will any threatened or endangered species be affected?
- What effects will increased human activity have on nearby habitats (e.g. Sandy River fisheries)?
- How will potential conflicts between waterfowl and aircraft using the Troutdale Airport be resolved?

**8. *Visual Resources***

- What are the effects on views for Troutdale residents on the west side of the Sandy River?
- What are the effects on views for travelers entering the Gorge?

**9. *Archaeological and Cultural Resources***

- With increased site access, what measures will be needed to protect sensitive archaeological and cultural resources?
- Will the project affect the National Register of Historic Places eligible dam on the old Sandy River channel?

**10. *Relationship to Other Land Uses***

- What will be the effects of gateway development on Lewis and Clark State Park? The City of Troutdale? Troutdale Airport?
- How will impacts to state park lands be minimized as required by section 4(f) of the USDOT Act?
- What are the effects of the proposed interchange improvements on the Wild and Scenic Rivers designation of the Sandy River?

**11. *Air Quality/Noise***

- What are the effects of increased traffic on air quality and noise levels?
- What effects will noise from on-site recreational activities and off-site freeway traffic and aircraft have on wildlife habitat enhancement and recreational uses?

This EIS does not include an analysis of socioeconomic impacts but does include cost estimates for each alternative (in Chapter 2). Socioeconomic impacts are not addressed because:

- The limitations on the size and functions included in the gateway facility mean that it will not be a destination in itself and will only serve people who would already be visiting the Gorge. The gateway will facilitate dispersing tourists (and their associated economic benefits) to communities throughout the Gorge. Overall economic impacts of the NSA are described in the "Economic Opportunities Study" prepared for the Columbia River Gorge Commission by Economics Research Associates in 1988.
- The construction of the gateway and recreational facilities, the Jordan Road interchange improvements, and the landscape enhancement will not generate significant long-term employment or cause workers to move to the project area during the construction period.
- The NSA Management Plan has determined the level of recreational use/development allowed on the site. Most of the site is designated for Open Space with limited recreational facility development. Therefore, the site is not likely to generate related economic impacts (restaurants, equipment rental, overnight housing, etc.).
- The site is located outside the Portland Metropolitan Area Urban Growth Boundary, with severe limitations on development in the immediate area, which reduces the likelihood of induced economic/employment impacts from the project.
- Land uses in the surrounding area are not likely to be affected by the project because the site is physically separated from these uses by the Sandy River and Broughton Bluff.

Section 2.5 includes a comparison of the initial costs of implementing each alternative, including construction costs for site preparation and interchange construction, which are the primary costs. Since the site is immediately adjacent to the Portland and Vancouver metropolitan areas, construction workers would be likely to come from these areas, and the construction-related impacts of this project would be minor relative to the overall volume of construction in the Portland and Vancouver metropolitan areas. The indirect or induced economic impacts of the interchange and site improvements would be minor, because of the location of the site outside the Urban Growth Area and its physical separation from other private land.

## **1.9 OTHER ACTIONS AND PERMITS**

If an alternative is selected other than the no action alternative, there will be a number of other discretionary actions that will be required prior to project implementation. Table 1.9-1 presents the list of discretionary actions or permits that are required prior to the implementation of the various possible proposed actions.

In addition, there may need to be property exchanges between certain agencies prior to project implementation. For example, ODOT may need to exchange property with the FS and possibly OPRD if improvements to I-84 and the Jordan interchange are selected or if the gateway is to be located on ODOT property.



**TABLE 1.9-1  
REQUIRED DISCRETIONARY ACTIONS OR PERMITS**

<b>RESPONSIBLE AGENCY/PARTY</b>	<b>DISCRETIONARY ACTION OR PERMIT</b>
U.S. Forest Service	Consistency determinations NSA, Mediated Agreement on Vegetation Management, Wild & Scenic Rivers Act, President's Plan
Army Corps of Engineers	Section 404 fill permit
U.S. Coast Guard	Design review of boat ramps, fishing dock, widening bridges
U.S. Fish and Wildlife Service	Endangered Species Act consultation
National Marine Fisheries Service	Endangered Species Act consultation
Federal Highway Administration	Section 4(f) determination; design approval; wetlands determination; interstate access alteration approval
U.S. Department of the Interior	Section 4(f) review
Advisory Council on Historic Preservation	Section 106 consultation; Section 4(f) review (if eligible historic sites are affected by federally funded transportation project)
Oregon Department of Transportation	Access permit; exchange/transfer of property (if gateway south of I-84); add interchange improvements to Statewide Transportation Improvement Program
State Historic Preservation Office	Section 106 consultation; Section 4(f) review (if eligible historic sites are affected by a federally funded transportation project)
Oregon Division of State Lands	Removal/Fill permit; design review for boat ramp, moorage or dock
Oregon State Parks and Recreation Department	Possible granting of easement for realignment of Jordan Road
Oregon Department of Environmental Quality	National Pollutant Discharge Elimination System (NPDES) permit, 401 certification
Oregon Water Resources Department	Well water appropriation or public water line extension
Oregon State Marine Board	Boat moorage (dock) review and approval
Multnomah County	Grading and building permits and plan review (for non-federal lands east of Sandy River), sanitary drainfield permit; NSA consistency (for non-federal lands)
City of Troutdale	Grading and building permits (for area west of Sandy River), public sewer or water line extension
Union Pacific Railroad	Possible easement for realignment of Jordan Road under railroad track
Federal Aviation Administration/ Port of Portland	Design review, Notice of Intent to Construct (within clear zone)
Bonneville Power Administration	Design review approval to cross powerline easement with improved trails
Northwest Pipeline Corporation	Design review to cross pipeline easement with improved trails

## 2.0 ALTERNATIVES

### 2.1 INTRODUCTION

This chapter describes the process used in developing alternatives based on the issues identified during scoping, alternatives that were eliminated from detailed study, and alternatives considered in detail. It describes how the alternatives were developed and how they differ in responding to the significant issues identified in Chapter 1. The alternatives are presented in comparison form to provide a clear basis for choice for the public and decision-maker. In addition, a summary comparison of the effects identified for each of the alternatives evaluated in this EIS is provided at the end of this chapter. The complete analysis is provided in Chapter 4.0.

The alternatives evaluated in this EIS were developed through a cooperative effort of the FS, ODOT, OPRD, Multnomah County, and DSL. The alternatives were reviewed by other interested agencies and the public, and their comments and suggestions were incorporated in the alternatives or are addressed in the analysis of impacts (see Section 1.4 for discussion of public and agency involvement).

Alternative locations for the gateway facility were identified by considering site constraints (sensitive habitat, flood hazard zones, access) and the functions that the facility would serve. There are very few places in the study area which met all the requirements. The alternatives include the optimum locations north and south of I-84.

Landscape pattern alternatives were developed using information about historic vegetation patterns, existing plant species, soil types, topography, hydrology, and proposed use patterns. Proposed landscape patterns have been modified based on careful review of these factors and vegetation management techniques. As a result, any of the proposed landscape patterns is achievable, although some will be more difficult than others.

The trails and recreational facilities described in each alternative were established by considering existing usage patterns, views, and key recreational features (river access, views, habitat diversity). The proposed trail system was then field-checked for recreational experience, access to key site features, and ease of construction. A modified network was flagged in the field for evaluation of archaeological and natural resource impacts. Final refinements were made after evaluation of these potential impacts.

Each action alternative has trails of varied accessibility. Trails in the center of the site meet universal design standards. The further one moves from the center of the site, the more challenging the trails become. As a result, all of the action alternatives would provide recreational trails for a range of users.

Instead of developing alternatives reflecting all possible approaches to each issue, a range of possible strategies has been incorporated into four "action" alternatives. This ensures that the NEPA analysis can address maximum and minimum impacts of changes related to these issues. A set of four alternatives (including the no action alternative) was also presented to the interagency task force for review and comment, and described in a newsletter for public comment. A public meeting to discuss the alternatives was held on April 13, 1994, and site tours were held on April 30 and May 10, 1994. A fifth alternative blending elements of the existing alternatives was created in response to public and agency input.

The five alternatives selected for further evaluation are practical or feasible in terms of technical factors, economic factors, and resource capability; and except for the "no action" alternative (No. 1), they are consistent with the NSA goals, policies, and guidelines. Each of the "action" alternatives varies in theme and emphasis placed on each given feature, and the amount of intervention necessary to implement the alternative. A variety of combinations of project elements were identified by the public and agencies; all of which are encompassed by the range of alternatives selected for evaluation in this EIS--see Section 2.4 for a detailed description of these alternatives.

## **2.2 ALTERNATIVES ELIMINATED FROM DETAILED STUDY**

Six alternatives suggested during scoping were considered but eliminated from further evaluation. Three of these included variations on the land use patterns and uses on the Delta, and three were alternatives (or options) for the Jordan interchange design.

### **2.2.1 Land Use Alternatives Eliminated From Detailed Study**

One alternative that was eliminated would have located the gateway facility in a location other than the area designated for Public Recreation and gateway development in the NSA Management Plan. For example, the Troutdale Chamber of Commerce is considering development of a tourism center on the west side of the City of Troutdale, and suggested that the gateway facility could be located there. Others have also suggested alternative sites. These alternatives are too speculative to evaluate at this time, and would not be consistent with the NSA Management Plan direction that a western gateway be located in the RIC 4 area. To locate a gateway facility on a different site in the NSA other than the RIC 4 area on the site would require an amendment to the NSA Management Plan. However, Alternatives 4 and 5 (which would provide an informational kiosk instead of a full gateway facility), and Alternative 1 (the no action alternative) could be consistent with the development of a gateway facility outside the NSA.

Another alternative would have maximized recreational development of the site, rather than emphasizing habitat enhancement, as required in areas designated for Open Space uses in the NSA Management Plan. Intensive recreation development of the site would not be consistent



with the NSA Management Plan or the objectives of the project, and was eliminated from further consideration.

Removal of the historic dam across the old channel of the Sandy River to restore perennial flows in this channel was also suggested. This alternative was not carried forward for several reasons. Removal of the dam would affect instream flows in the Sandy River, and therefore the fisheries in that river. The hydrologic modelling necessary to understand the implications of the removal of the dam is beyond the scope of this study. The dam is not under FS control; it is located on land owned by the DSL. Any decision to remove the dam is under DSL jurisdiction. In addition, the dam has been determined to be a significant historic resource, eligible for listing on the National Register of Historic Places. Removal of the dam would require consultation with the Advisory Council for Historic Preservation to demonstrate that there are no other feasible alternatives and to design appropriate mitigation. Since access to Sun Dial Island must be maintained for BPA and NWPC, the historic dam would have to be replaced by a bridge.

### **2.2.2 Interchange Alternatives Eliminated From Detailed Study**

Three interchange design alternatives were evaluated by the interdisciplinary review team and then eliminated from further review. One alternative would have eliminated the Jordan Road/I-84 interchange altogether, and two were variations on the interchange options that were selected for detailed evaluation.

An alternative was suggested that would have removed the Jordan Road interchange with I-84. This implied no gateway facility or an off-site gateway facility and minimal recreational development of the National Forest land north of I-84, because the lack of access would not support any other development. There were several reasons for eliminating this alternative from further consideration. This alternative would require a new crossing of the Sandy River in order to provide adequate alternative access for properties east of the river because weight limits on existing bridges would result in inadequate access to the community of Springdale. In addition, removing the interchange would increase traffic through Troutdale substantially, lowering the level of service in the area. The City of Troutdale opposed removal of the interchange. Opposition was also expressed by local residents and the Multnomah County Rural Fire Protection District No. 14.

Two alternatives were sketched preliminarily, but eliminated from detailed study for a variety of reasons. One interchange design alternative would develop a new diamond interchange and realign Jordan Road near Broughton Bluff. (See Figure 2.2-1.) Jordan Road would be relocated approximately 1,600 feet east of the existing I-84 overcrossing of Jordan Road. The basic difference between this option and the diamond interchange option selected for evaluation is that this option includes the realignment of Jordan Road and would develop a new UPRR undercrossing in lieu of using the existing Jordan Road undercrossing of the UPRR. This alternative is very similar to the interchange design proposed under Alternative 4, except for

the realignment of Jordan Road. This configuration would be less desirable for locating the Gateway facility south of I-84 on the ODOT Triangle because it would require that the existing Jordan Road roadway remain as an access road to the Gateway. The potential benefits of realigning Jordan Road and removing a portion or all of the existing roadway to improve recreational access to the Sandy River would be lost. In addition, this configuration would increase out-of-direction traffic to the Gateway.

A diamond interchange is less desirable for the alternative with the Gateway north of I-84, because it does not achieve as much improvement in weave length between interchanges and queuing distance on the off-ramps and so could not handle as great a traffic volume. The Gateway north of I-84 would have the greatest potential visitor volume of all the alternatives, because it would attract both visitors to the Gorge and those seeking to recreate at the facilities on site. Therefore, the interdisciplinary review team eliminated this alternative from detailed review. However, the diamond interchange and realignment of Jordan Road could be combined if that combination would mitigate adverse impacts of other alternatives evaluated in detail.

A variant on the folded diamond interchange was also eliminated from further consideration. (See Figure 2.2-2.) This configuration would not realign Jordan Road. The interchange ramps would be moved to the east to increase the length between the Troutdale interchange and the Jordan Road interchange ramps, and as a result, Jordan Road north of I-84 would be extended eastward. Also, the horizontal alignments, deceleration, and acceleration lengths would be brought up to current ODOT standards. Jordan Road would remain in its present location utilizing the existing UPRR undercrossing. Improvements at the railroad undercrossing would be necessary, as described for the diamond interchange option selected for detailed evaluation. This alternative was eliminated from further evaluation because it would require substantial out-of-direction travel if the gateway is located north of I-84, or it would require construction inside the interchange loop if the gateway is located south of I-84. In addition, with this alternative, the extension of Jordan Road north of I-84 could potentially impact a known sensitive plant species.

### **2.3 ALTERNATIVES CONSIDERED IN DETAIL**

This EIS evaluates the no action alternative (No. 1), as well as four action alternatives (Nos. 2-5) which have been developed for management of the Sandy River Delta. Each of the action alternatives would meet the purpose and need identified in Chapter 1.0. Figures 2.3-1 through 2.3-5 provide conceptual illustrations of the five alternatives being evaluated in this EIS, and Figures 2.3-6 through 2.3-9 provide engineering details and cross-sections of the two interchange options being considered.

Table 2.3-1 identifies the approximate amounts of each habitat type that would be developed for each alternative, and Table 2.3-2 presents the plant associations typical of each habitat type.



SCALE  
0 100 200 300 400 500 600  
FEET

Scale - 1" = 300'



Sec. 29, T.1N, R.3E, S.4  
Sec. 30, T.1N, R.4E, S.4

RIVER

SANDY

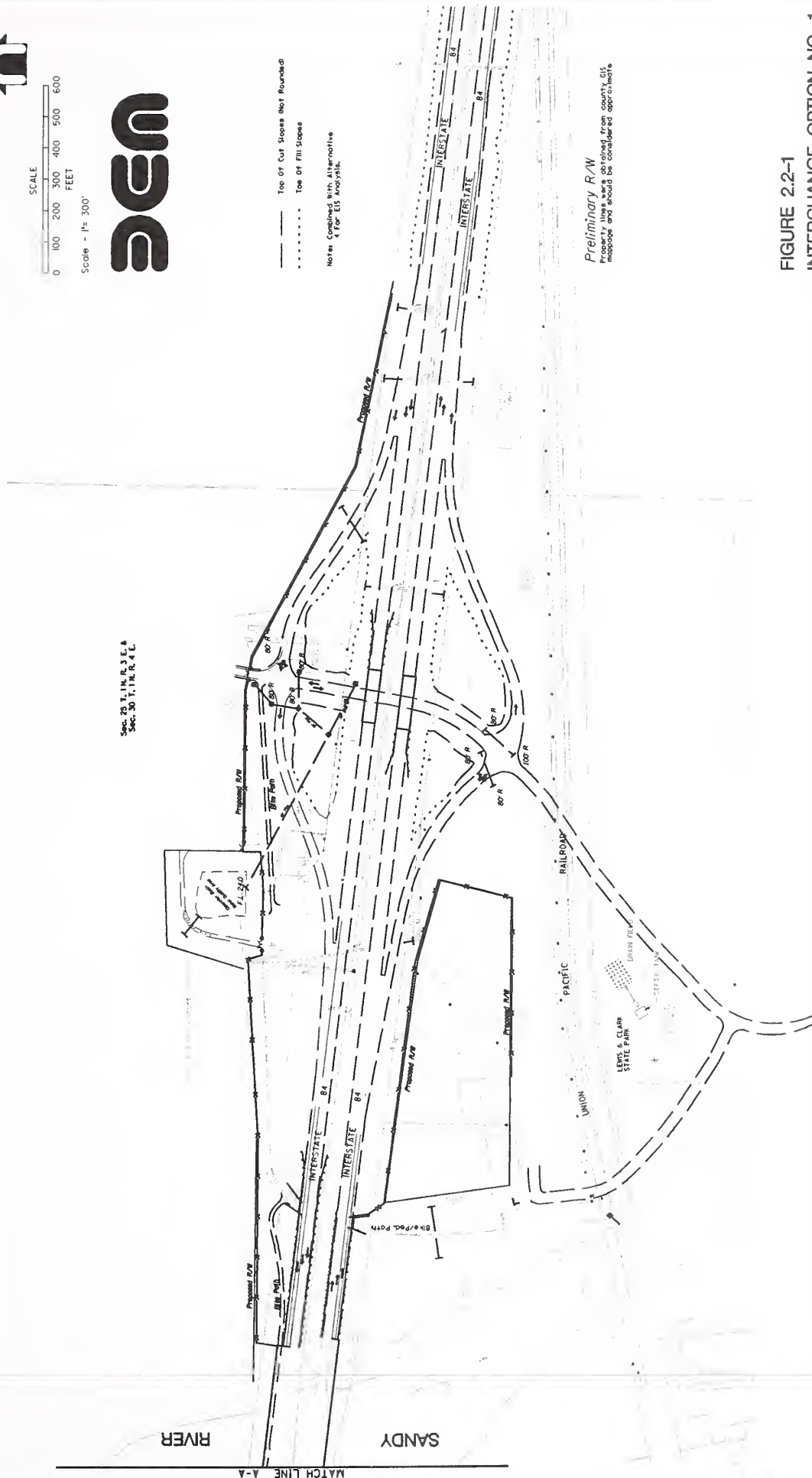
MATCH LINE A-A

Top Of Cut Slopes Not Rounded  
Top Of Fill Slopes

Notes Combined with Alternative  
1 for EIS Analysis.

Preliminary R/W  
Proposed Right-of-Way boundaries are shown for EIS  
analysis and should be considered approximate.

FIGURE 2.2-1  
INTERCHANGE OPTION NO. 1  
(Diamond)  
SANDY RIVER DELTA PLAN





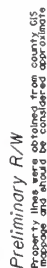


FIGURE 2.2-2  
INTERCHANGE OPTION NO. 2  
(Folded Diamond)  
SANDY RIVER DELTA PLAN





SCALE IN FEET, 1" = 1500'



5 ACRE PARCEL

# LEGEND - Alternatives

- HABITAT TYPES:**
- [Pattern] UPLAND FOREST
  - [Pattern] OAK SAVANNAH
  - [Pattern] UPLAND SCRUB-SHRUB
  - [Pattern] WETLAND FOREST/SCRUB-SHRUB
  - [Pattern] UPLAND MEADOW
  - [Pattern] WETLAND MEADOW
  - [Pattern] MUDFLATS/SANDBAR
  - [Pattern] OPEN WATER

# LEGEND

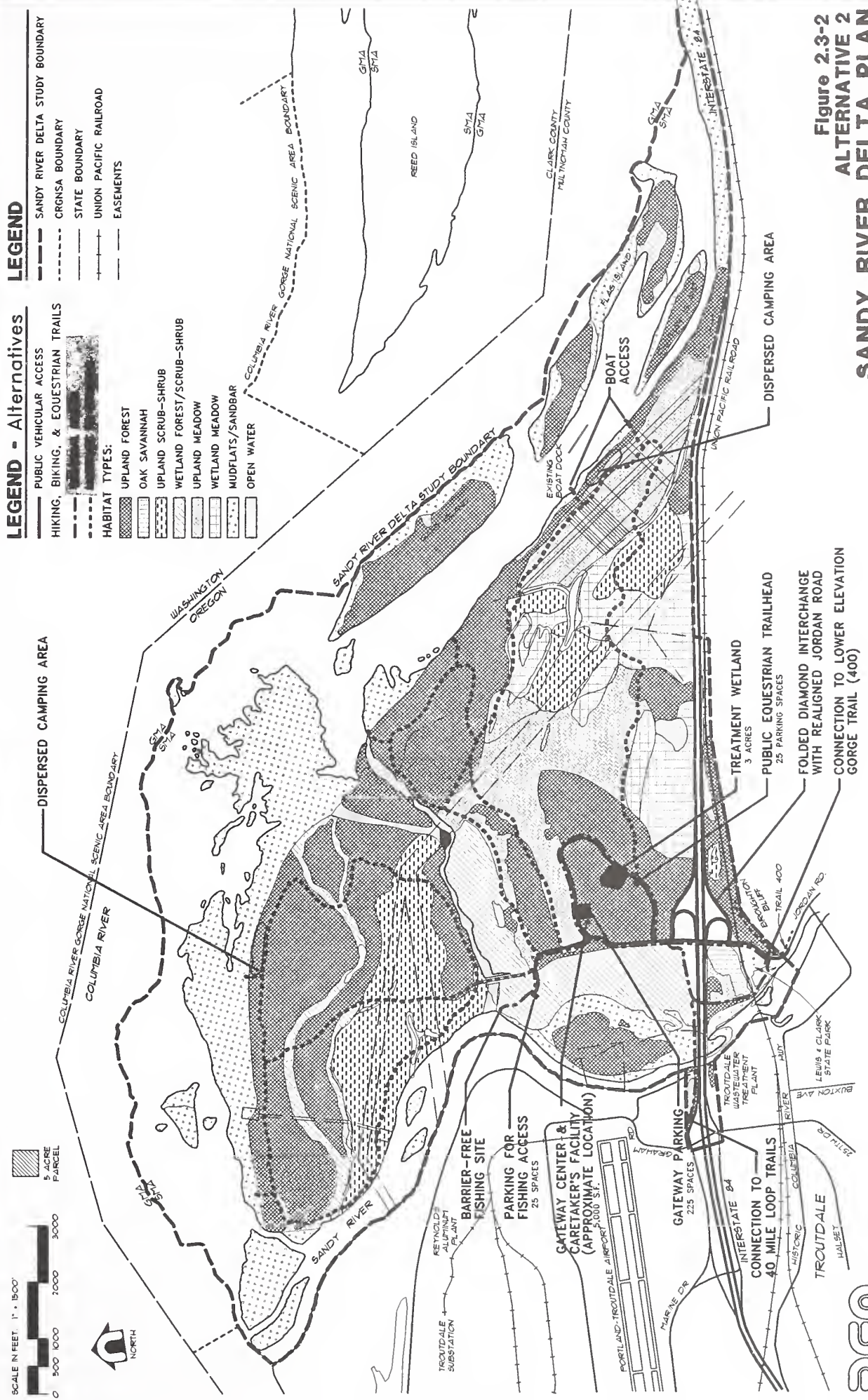
- [Line] SANDY RIVER DELTA STUDY BOUNDARY
- [Line] CRNSA BOUNDARY
- [Line] STATE BOUNDARY
- [Line] UNION PACIFIC RAILROAD
- [Line] EASEMENTS
- [Line] UNIMPROVED TRAILS



**Figure 2.3-1**  
**ALTERNATIVE 1 - No Action**  
**SANDY RIVER DELTA PLAN**  
 Columbia River Gorge National Scenic Area







**Figure 2.3-2**  
**ALTERNATIVE 2**  
**SANDY RIVER DELTA PLAN**  
Columbia River Gorge National Scenic Area





SCALE IN FEET, 1" = 500'



5-ACRE PARCEL

## LEGEND - Alternatives

PUBLIC VEHICULAR ACCESS

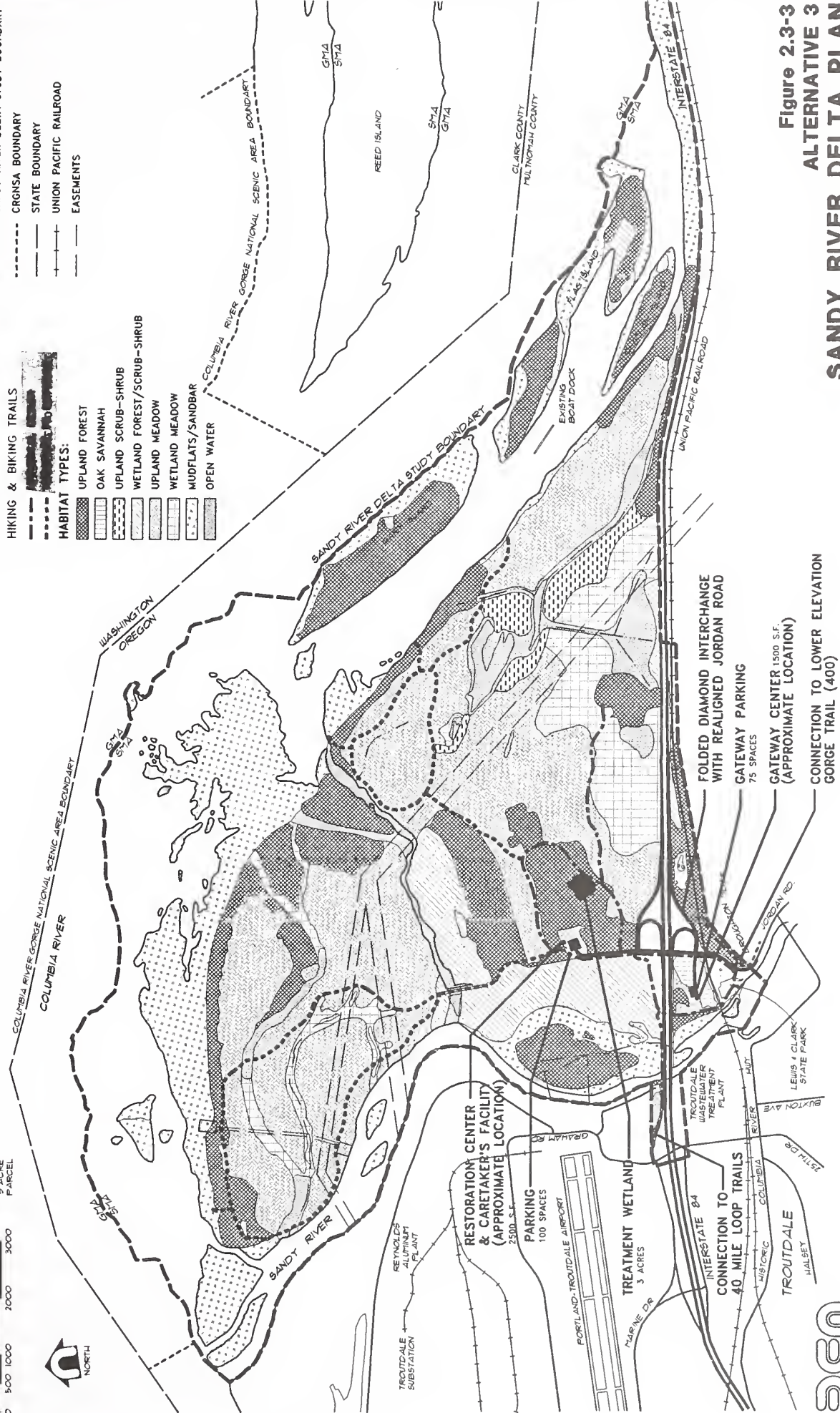
HIKING & BIKING TRAILS

HABITAT TYPES:

- UPLAND FOREST
- OAK SAVANNAH
- UPLAND SCRUB-SHRUB
- WETLAND FOREST/SCRUB-SHRUB
- UPLAND MEADOW
- WETLAND MEADOW
- MUDFLATS/SANDBAR
- OPEN WATER

## LEGEND

- SANDY RIVER DELTA STUDY BOUNDARY
- CRGNSA BOUNDARY
- STATE BOUNDARY
- UNION PACIFIC RAILROAD
- EASEMENTS



**Figure 2.3-3**  
**ALTERNATIVE 3**  
**SANDY RIVER DELTA PLAN**  
Columbia River Gorge National Scenic Area





SCALE IN FEET, 1" = 500'



5 ACRE PARCEL



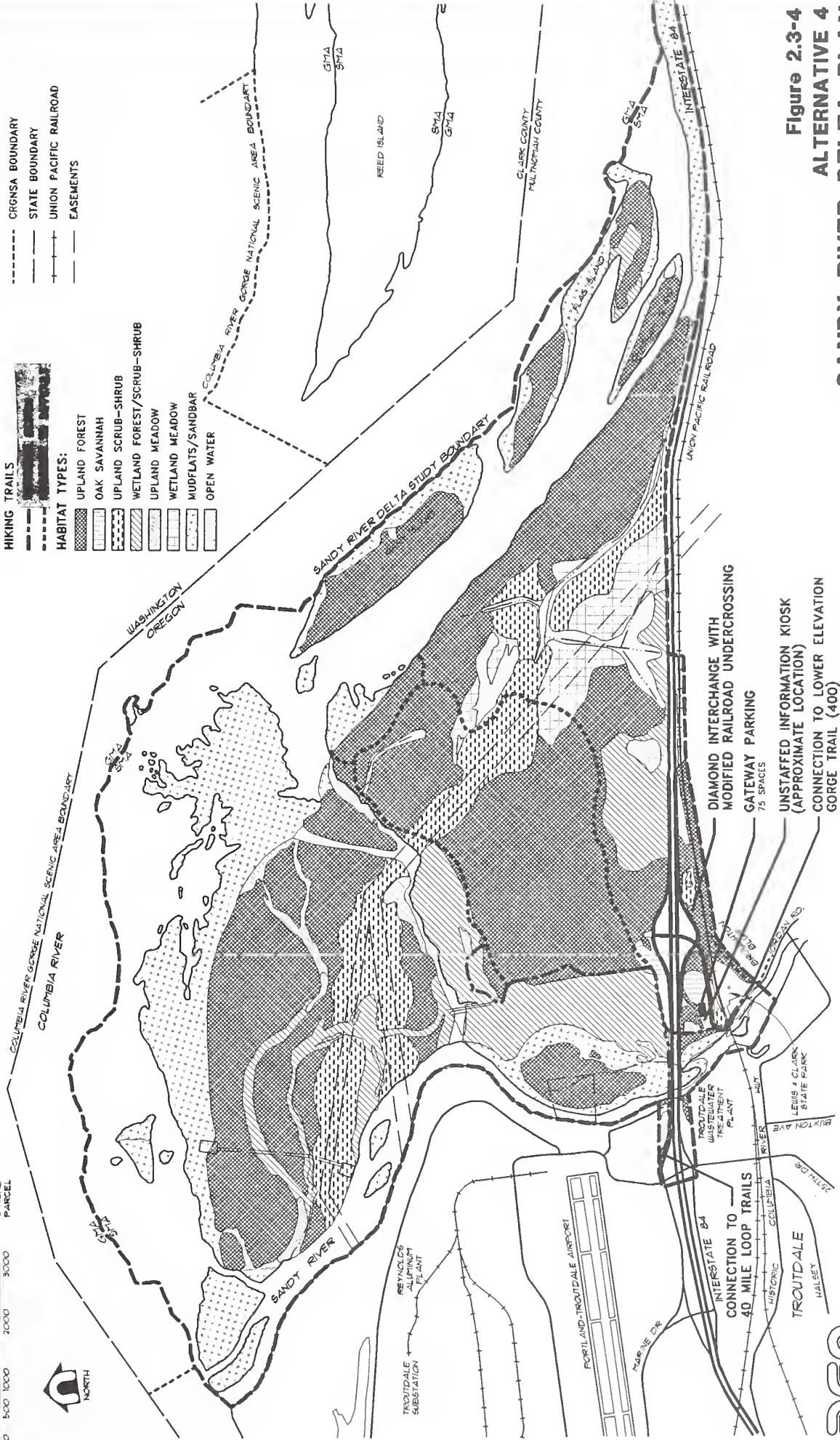
## LEGEND

### LEGEND - Alternatives

- PUBLIC VEHICULAR ACCESS
- HIKING TRAILS
- SANDY RIVER DELTA STUDY BOUNDARY
- ORGSA BOUNDARY
- STATE BOUNDARY
- UNION PACIFIC RAILROAD
- EASEMENTS

### HABITAT TYPES:

- UPLAND FOREST
- OAK SAVANNAH
- UPLAND SCRUB-SHRUB
- WETLAND FOREST/SCRUB-SHRUB
- UPLAND MEADOW
- WETLAND MEADOW
- MUDFLATS/SANDBAR
- OPEN WATER



DIAMOND INTERCHANGE WITH  
MODIFIED RAILROAD UNDERCROSSING  
GATEWAY PARKING  
75 SPACES  
UNSTAFFED INFORMATION KIOSK  
(APPROXIMATE LOCATION)  
CONNECTION TO LOWER ELEVATION  
GORGE TRAIL (400)

**Figure 2.3-4**  
**ALTERNATIVE 4**  
**SANDY RIVER DELTA PLAN**  
Columbia River Gorge National Scenic Area





SCALE IN FEET, 1" = 500'



9 ACRE  
PENCIL



## LEGEND - Alternatives

— PUBLIC VEHICULAR ACCESS

— HIKING & BIKING TRAILS

— ~~WETLAND~~ ~~WETLAND~~

— STATE BOUNDARY

— UNION PACIFIC RAILROAD

— EASEMENTS

## HABITAT TYPES:

— UPLAND FOREST

— OAK SAVANNAH

— UPLAND SCRUB-SHRUB

— WETLAND FOREST/SCRUB-SHRUB

— UPLAND MEADOW

— WETLAND MEADOW

— MUDFLATS/SANDBAR

— OPEN WATER

## LEGEND

— SANDY RIVER DELTA STUDY BOUNDARY

— CRGNSA BOUNDARY

— STATE BOUNDARY

— UNION PACIFIC RAILROAD

— EASEMENTS

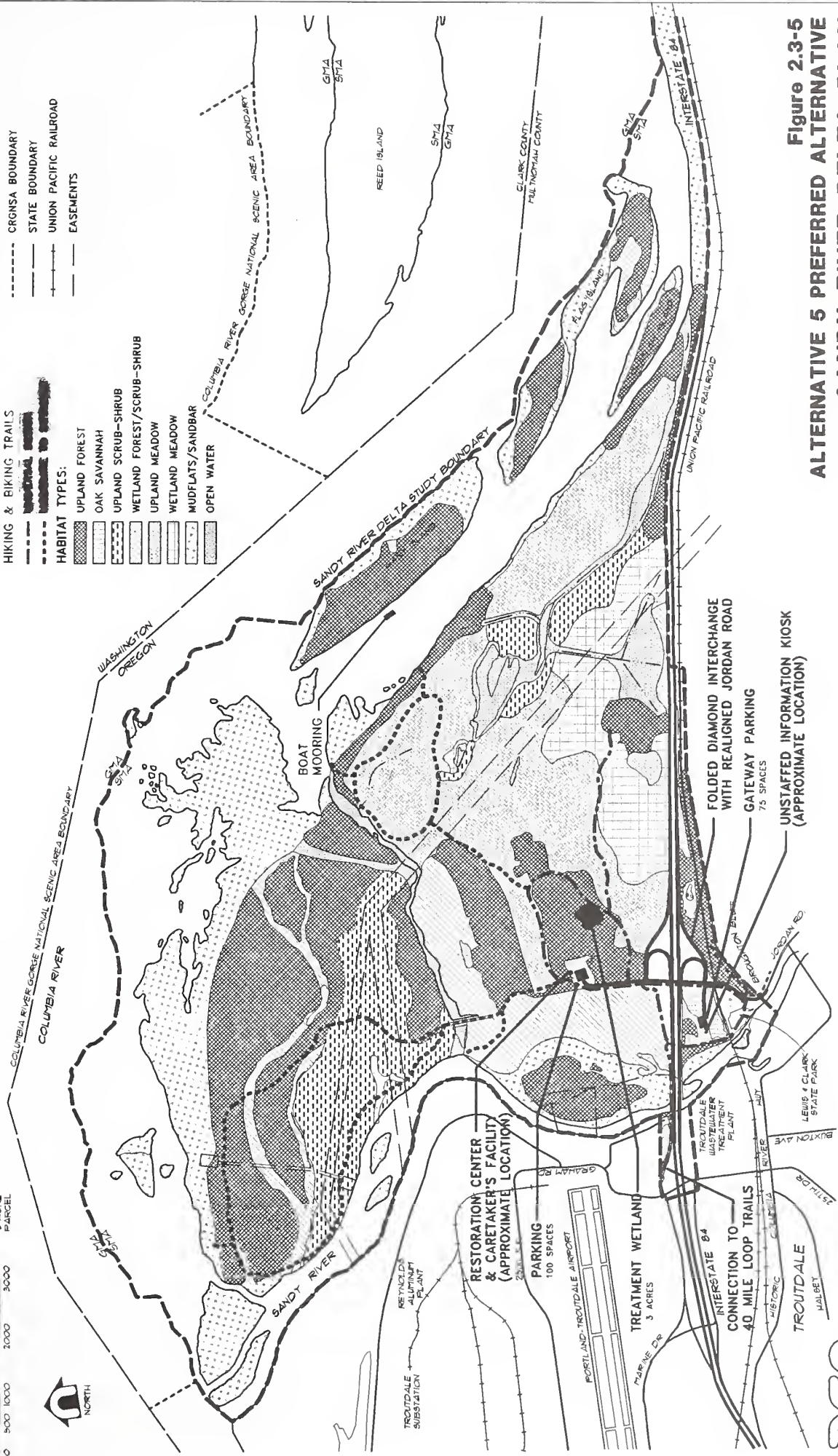


Figure 2.3-5  
ALTERNATIVE 5 PREFERRED ALTERNATIVE  
SANDY RIVER DELTA PLAN

Columbia River Gorge National Scenic Area

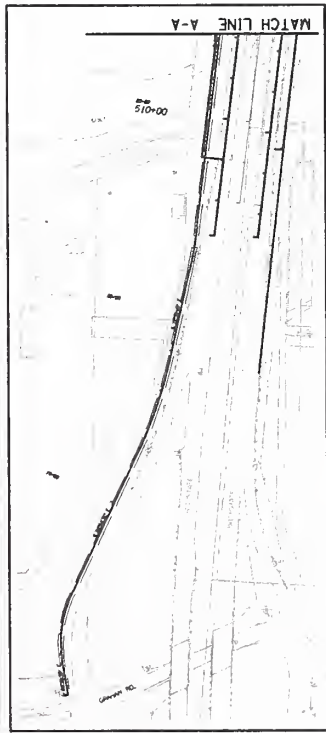






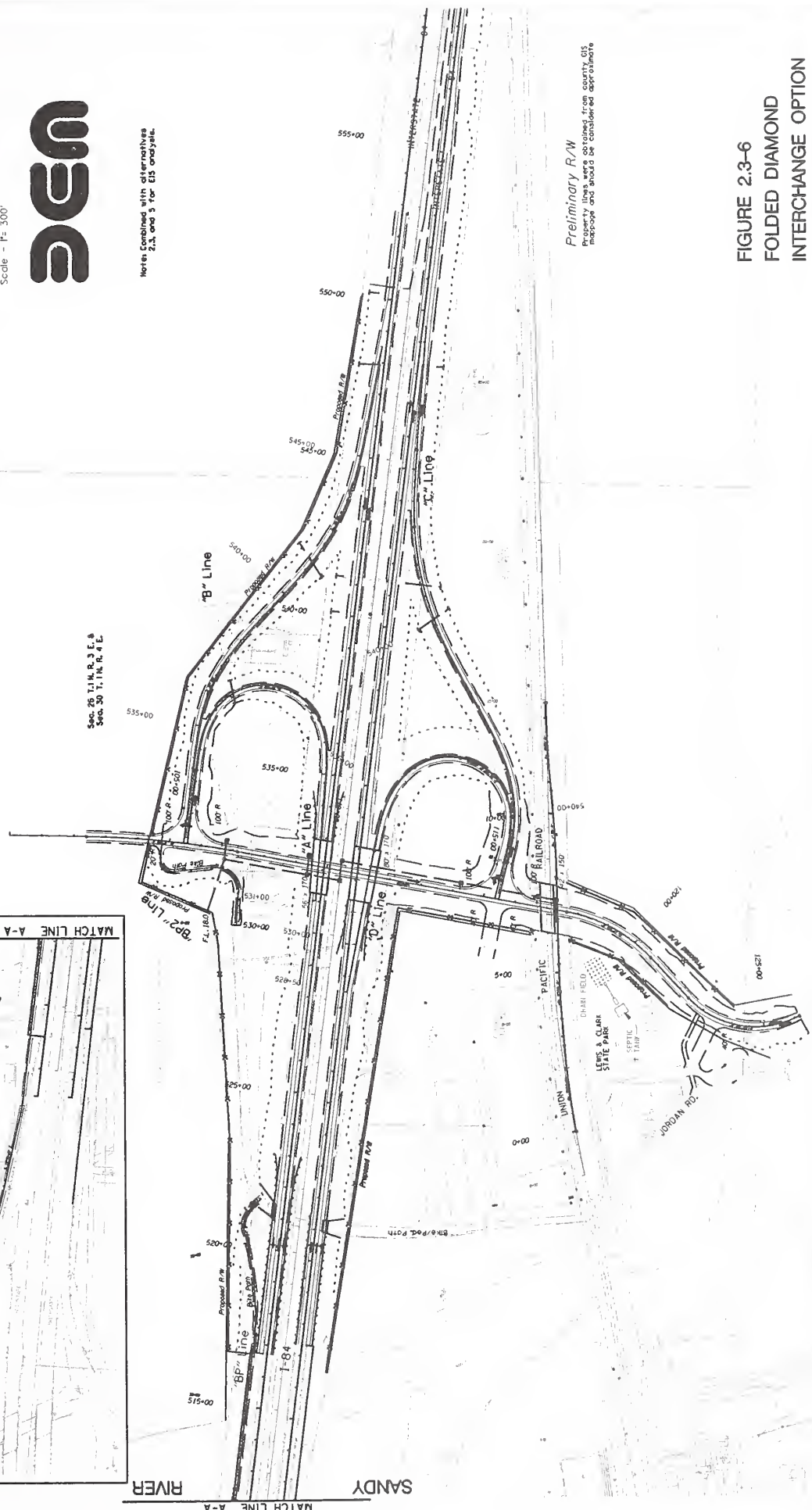
Note: Combined with alternatives 2, 3 and 5 for EIS analysis.

Top Of Cut Slopes (Not Rounded)  
Top Of Fill Slopes



Sec. 26 T.1 N. R. 3 E. 8  
Sec. 30 T.1 N. R. 4 E.

MATCH LINE A-A SANDY RIVER



Preliminary R/W  
Property lines were obtained from county GIS  
mappage and should be considered approximate

FIGURE 2.3-6  
FOLDED DIAMOND  
INTERCHANGE OPTION  
SANDY RIVER DELTA PLAN





SCALE  
0 100 200 300 400 500  
FEET  
Scale - 1" = 300'

**W&A**

----- Top of Cut Slopes Not Shaded  
..... Top of Fill Slopes

NOTE: CONSTRUCTED WITH ALTERNATIVE  
4 FOR EIS ALTERNATIVE

Sec. 25 T. 14 N. R. 3 E. S. 8  
Sec. 30 T. 14 N. R. 4 E.



MATCH LINE A-A

RIVER

SANDY

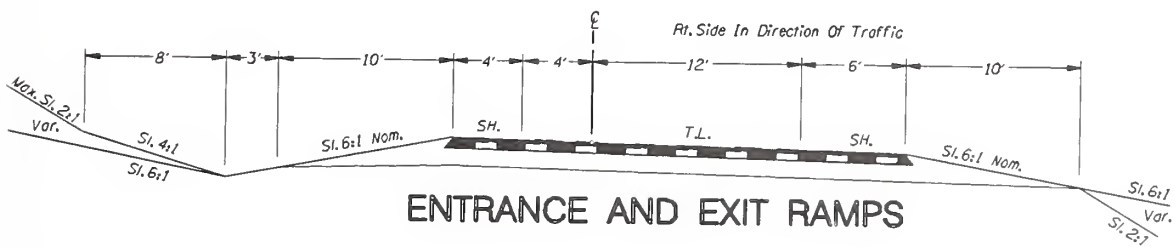
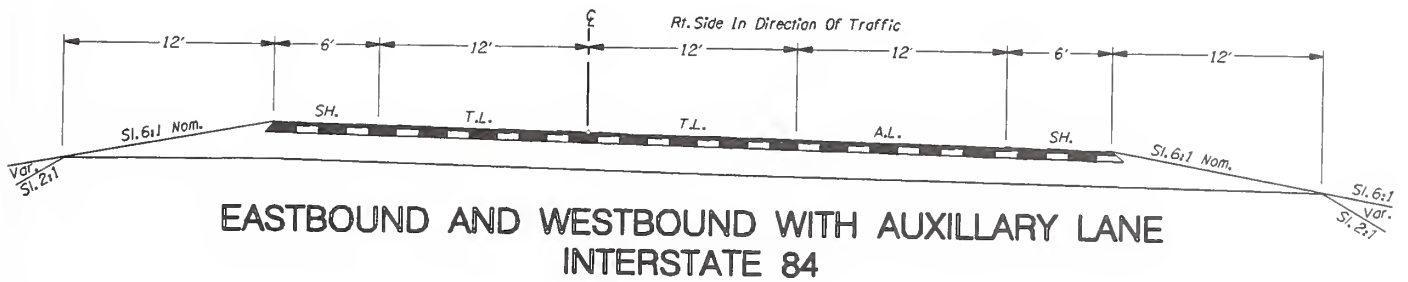
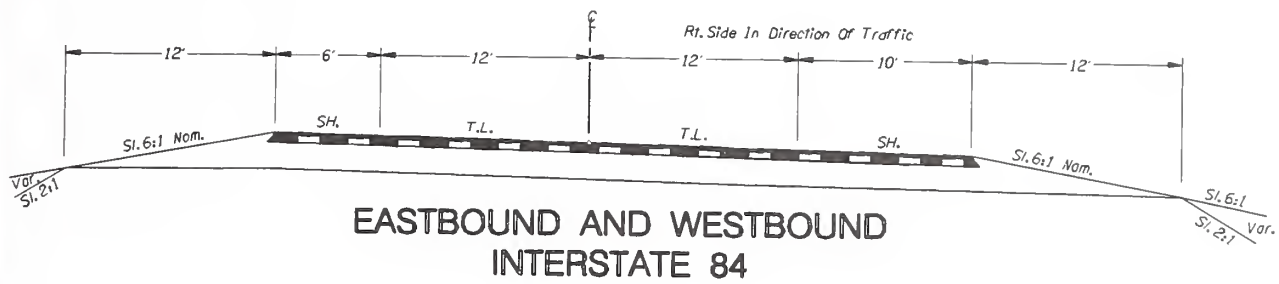
MATCH LINE A-A

"Bp2" Line  
"A" Line  
"B" Line  
"C" Line  
"D" Line  
"E" Line  
"F" Line  
"G" Line  
"H" Line  
"I" Line  
"J" Line  
"K" Line  
"L" Line  
"M" Line  
"N" Line  
"O" Line  
"P" Line  
"Q" Line  
"R" Line  
"S" Line  
"T" Line  
"U" Line  
"V" Line  
"W" Line  
"X" Line  
"Y" Line  
"Z" Line

Preliminary R/W  
Property lines were obtained from county GIS  
mapings and should be considered approximate

FIGURE 2.3-7  
DIAMOND INTERCHANGE  
OPTION  
SANDY RIVER DELTA PLAN



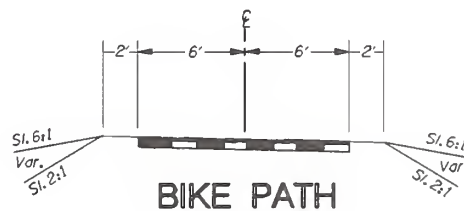
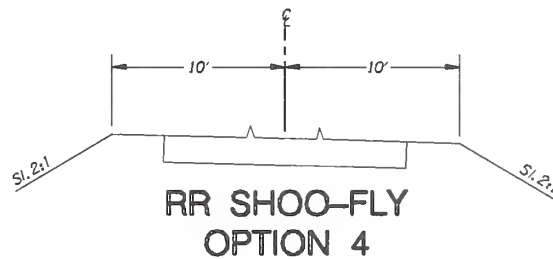
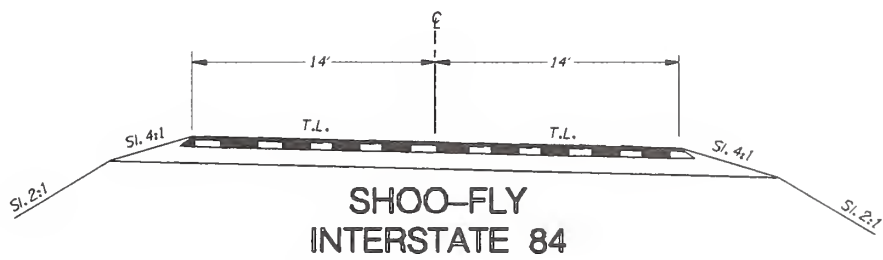
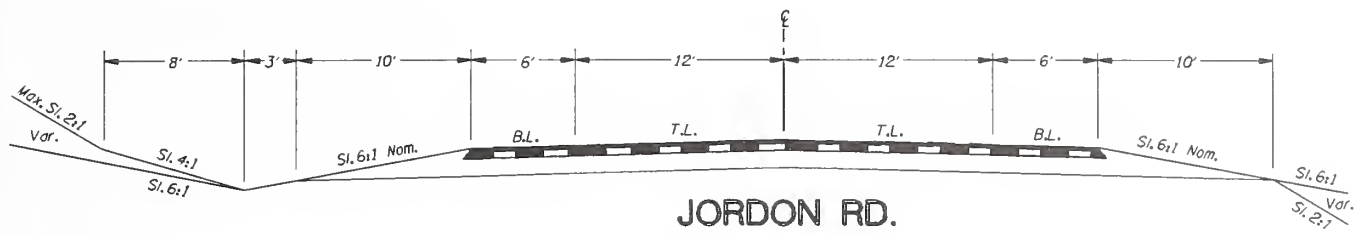


T.L. = Travel Lane  
A.L. = Auxillary Lane  
Sh. = Shoulder  
B.L. = Bike Lane

**FIGURE 2.3 - 8  
ROADWAY TYPICAL SECTIONS  
SANDY RIVER DELTA PLAN**







T.L. = Travel Lane  
 A.L. = Auxillary Lane  
 Sh. = Shoulder  
 B.L. = Bike Lane



DAVID EVANS AND ASSOCIATES, INC.  
 ENGINEERS, SURVEYORS, LANDSCAPE ARCHITECTS  
 2428 S.W. CORBETT AVENUE  
 PORTLAND, OREGON 97201-4802  
 (503) 225-6663

**FIGURE 2.3 - 9  
 ROADWAY TYPICAL SECTIONS  
 SANDY RIVER DELTA PLAN**



More detail on these plant associations is contained in the Natural Resources Technical Memorandum in the analysis file.

**TABLE 2.3-1**  
**SUMMARY OF ACRES FOR EACH HABITAT TYPE**

<i>Habitat Types</i>	<i>Alternative 1</i>		<i>Alternative 2</i>		<i>Alternative 3</i>		<i>Alternative 4</i>		<i>Alternative 5</i>	
	<i>Acres</i>	<i>Percent of Total</i>	<i>Acres</i>	<i>Percent of Total</i>	<i>Acres</i>	<i>Percent of Total</i>	<i>Acres</i>	<i>Percent of Total</i>	<i>Acres</i>	<i>Percent of Total</i>
<b>Upland Forest</b>	431	25.6%	791	46.6%	442	26.5%	992	58.6%	606	36.2%
<b>Oak Savannah</b>	6	0.4%	8	0.5%	8	0.5%	10	0.6%	8	0.5%
<b>Upland Scrub-Shrub</b>	12	0.7%	224	13.2%	48	2.9%	227	13.4%	206	12.3%
<b>Wetland Forest/ Scrub-Shrub</b>	123	7.3%	190	11.2%	155	9.3%	291	17.2%	198	11.8%
<b>Upland Meadow</b>	961	57.1%	267	15.7%	741	44.5%	5	0.3%	398	23.8%
<b>Wetland Meadow</b>	84	5.0%	171	10.1%	142	8.5%	77	4.6%	129	7.7%
<b>Open Water</b>	66	4.0%	44	2.6%	131	7.9%	91	5.4%	128	7.6%

*Note:* Calculated from maps of alternatives. Column totals vary due to rounding error or mapping inconsistencies.

**TABLE 2.3-2**  
**SUMMARY OF PLANTS TYPICAL OF EACH HABITAT TYPE**

<i>COVER TYPE</i>	<i>DOMINANT VEGETATION</i>	
<b>Forest</b>	<b>Upland</b>	big-leaf maple, Oregon ash, black cottonwood, red alder, vine maple, dwarf Oregon grape, swordfern, Oregon oxalis, vanilla leaf
	<b>Wetland</b>	black cottonwood, Pacific willow, red-osier dogwood, Douglas spirea, bog blueberry, skunk cabbage, sedge
<b>Savannah</b>		Oregon white oak, western serviceberry, snowberry, rose, swordfern, bedstraw, bluegrass, wild rye
<b>Scrub-Shrub</b>	<b>Upland</b>	rose, bentgrass, wild oat, western serviceberry, deerbrush
	<b>Wetland</b>	Douglas spirea, Pacific willow, bog blueberry, sedge, rush, red-osier dogwood
<b>Meadow</b>	<b>Upland</b>	blue wild rye, brome, common vetch, fleabane, fescue
	<b>Wetland</b>	sedge, bulrush, marsh marigold, false hellebore, common cow parsnip

*Note:* This table is not intended to display a complete or final plant list, which will be developed in the design phase.  
*Sources:* USDA Forest Service Northwest Region, Publications: R6-ECOL-232A-86, R6-ECOL-257-B-86, R6-ECOL-TP-004-88, and R6-ECOL-TP-006-88.

Table 2.3-3 presents a list of the gateway, recreational and other facilities that would be provided with each alternative, and Table 2.3-4 presents a list of the uses that would be permitted with each alternative.

### **2.3.1 Design Guidelines, Management Strategies and Implementation Considerations Common to All Action Alternatives**

#### ***Design Guidelines***

Design guidelines identified in the NSA Management Plan would apply to any of the action alternatives. These guidelines are aimed at protecting the scenic, cultural, natural and recreation resources in the NSA, and are summarized below.

- Buildings shall have an overall horizontal appearance in areas with little tree cover. Structure height shall remain below the average canopy height of the natural vegetation adjacent to the structure, if feasible for the function of the structure.
- Use of plant species native to the landscape setting shall be encouraged. Where non-native plants are used, they shall have native-appearing characteristics.
- The exteriors of structures shall be earth-tone or water-tone colors that will result in low contrast with the surrounding landscape.
- Proposed developments or land uses shall be aligned, designed, and sited to fit the natural topography and to take advantage of vegetation and landform screening, and to minimize visible grading or other modifications of landforms, vegetation cover, and natural characteristics.
- Any exterior lighting shall be sited, limited in intensity, shielded, or hooded in a manner that prevents lights from being visible from key viewing areas and from noticeably contrasting with the surrounding landscape setting, except for road lighting necessary for safety purposes.
- Reflectivity of structures and site improvements shall be minimized.
- Right-of-way vegetation shall be managed to minimize visual impacts of clearing and other vegetation removal from key viewing areas. Roadside vegetation . . . should enhance views from the highway.



**TABLE 2.3-3**  
**SUMMARY OF GATEWAY, SUPPORT, AND RECREATIONAL FACILITIES**

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5
<b>Gateway and Support Facilities</b>					
<i>Gateway Facility</i>	None on-site	North of I-84, 5,000 square feet	South of I-84, 1,500 square feet	South of I-84, information kiosk	South of I-84, information kiosk
<i>Restoration Center</i>	None	Incorporated into gateway facility	North of I-84, 2,500 square feet	None	North of I-84, 2,500 square feet
<i>Caretaker's Residence</i>	None	Incorporated into gateway facility	Incorporated into restoration center	None	Incorporated into restoration center
<i>Vehicular Access/Jordan Interchange</i>	No change from existing access routes	Folded diamond interchange with Jordan Rd. realigned near Broughton Bluff, includes widening of I-84 bridges over Sandy River	Folded diamond interchange with Jordan Rd. realigned near Broughton Bluff, includes widening of I-84 bridges over Sandy River	Diamond interchange, includes widening of I-84 bridges over Sandy River	Folded diamond interchange with Jordan Rd. realigned near Broughton Bluff, includes widening of I-84 bridges over Sandy River
<i>Paved Parking Lots (# of spaces)</i>	North of I-84 0  Lewis & Clark St. Park (paved) <u>125</u>  <i>Total</i> 125	North of I-84 - gateway 225 - trail head 25 - fish'g site <u>25</u> Subtotal New Prkg. 275  Lewis & Clark St. Park (paved) <u>125</u>  <i>Total</i> 400	North of I-84 - restor'n ctr 100 South of I-84 - gateway <u>75</u> * Subtotal New Prkg. 175  Lewis & Clark St. Park (paved) <u>125</u>  <i>Total</i> 300  * Shared with Lewis & Clark St. Park	North of I-84 0  South of I-84 - gateway <u>75</u> * Subtotal New Prkg. 75  Lewis & Clark St. Park (paved) <u>125</u>  <i>Total</i> 200  * Shared with Lewis & Clark St. Park	North of I-84 - restor'n ctr 100 South of I-84 - gateway <u>75</u> * Subtotal New Prkg. 175  Lewis & Clark St. Park (paved) <u>125</u>  <i>Total</i> 300  * Shared with Lewis & Clark St. Park

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5
<b>Restrooms</b>	None north of I-84  Restroom at Lewis & Clark State Park  None north of I-84	At gateway/restoration center facility, near boat moorings & dispersed campground sites  Restroom at Lewis & Clark State Park  Composting toilets provided at restrooms near camping areas; treatment wetland to treat wastewater from gateway facility, restoration center & caretaker's residence or connection to Troutdale system	At gateway facility & restoration center  Restroom at Lewis & Clark State Park  Composting toilets and treatment wetland near restoration center to treat wastewater from restoration center & caretaker's residence; gateway center to connect to Lewis & Clark drainfield, develop own system, or connect to Troutdale system	None north of I-84  Restroom at Lewis & Clark State Park  None north of I-84	At restoration center, and on Thousand Acres near trail/boat mooring  Restroom at Lewis & Clark State Park  Portable toilets provided near boat mooring; treatment wetland to treat wastewater from restoration center & caretaker's residence;
<b>Sewage Treatment</b>	Septic system at Lewis & Clark State Park	Septic system at Lewis & Clark State Park	Septic system at gateway and Lewis & Clark State Park	Septic system at Lewis & Clark State Park	Septic system at Lewis & Clark State Park
<b>Water Supply</b>	Spring on Broughton Bluff supplies area north of I-84  Lewis & Clark State Park has a well on-site	Connection to spring or new well to serve gateway complex  Lewis & Clark State Park has a well on-site	Gateway shares water supply with Lewis & Clark State Park  Caretaker/Restoration Center has new well  Lewis & Clark State Park has a well on-site	None north of I-84  Lewis & Clark State Park has a well on-site	Caretaker/Restoration Center has new well  Lewis & Clark State Park has a well on-site
<b>Interpretive Signs/Displays</b>	None	Yes	Yes	Yes	Yes

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5
<b>Recreation Facilities (Does not include facilities in Lewis &amp; Clark State Park)</b>					
<b>Trails</b>	Approximately 8 miles of unimproved trails available for hiking, biking, or equestrian use	12-15 miles of hiking, mountain biking & equestrian trails (including range of universal design trails) and an equestrian trailhead/corral	7-9 miles of hiking and mountain biking trails (including range of universal design trails)	4-6 of hiking trails (including range of universal design trails)	7-9 miles of hiking and mountain biking trails (including range of universal design trails)
<b>Picnic Tables &amp; Fire Pits</b>	None	In RIC 4 area near gateway facility	In RIC 4 area near gateway facility south of I-84	None	In RIC 4 area near restoration center
<b>Boat Access Facilities</b>	Boat ramp on Sandy River west of Lewis & Clark State Park, and boat mooring between Thousand Acres and Flag Island	Same as Alt. 1 plus two additional boat moorings between Thousand Acres and Flag Island, and one boat mooring near north end of Sun Dial Island	Same as Alt. 1	Boat ramp on Sandy River west of Lewis and Clark State Park, boat mooring between Thousand Acres and Flag Island removed	Boat ramp on Sandy River west of Lewis and Clark State Park, boat mooring moved to between Thousand Acres and Gary Island
<b>Camping Facilities</b>	No camping facilities	Access stairway and restrooms provided in support of boat-in or walk-in camping on east side of Thousand Acres; restrooms also provided on north end of Sun Dial Island to support dispersed camp sites	No camping facilities	No camping allowed	No camping
<b>Barrier-Free Fishing Site</b>	None	One--north of I-84, on east side of river	None	None	None
<b>Universal Design</b>	None	Easy, moderate, and difficult trails proposed.	Easy, moderate, and difficult trails proposed.	Easy, moderate, and difficult trails proposed.	Easy, moderate and difficult trails proposed.



**TABLE 2.3-4**  
**SUMMARY OF PERMITTED USES**

<b>PERMITTED USES</b>	<b>ALTERNATIVE 1</b>	<b>ALTERNATIVE 2</b>	<b>ALTERNATIVE 3</b>	<b>ALTERNATIVE 4</b>	<b>ALTERNATIVE 5</b>
Hiking	yes	yes	yes	yes	yes
Mountain Biking	yes	yes	yes	no	yes
Equestrian	yes	yes	no	no	no
Fishing	yes	yes	yes	yes	yes
Picnicking	yes	yes	yes	yes	yes
Dispersed Camping	yes	yes, at designated sites	yes, outside RIC 4	no	no
Hunting	yes, with restrictions	no	yes, with restrictions	yes, with restrictions	yes, with restrictions
Special Forest Products Collection	yes	no--first 3 years yes--after 3 years	no--first 3 years yes--after 3 years	no	no--first 3 years yes--after 3 years
Dog Walking, Organized Dog Training, or Field Trials	yes	no	yes, with restrictions	yes, with restrictions	yes, with restrictions
Boating	yes	yes	yes	yes	yes
Rock Climbing	yes	yes	yes	yes	yes
Swimming/Water Play	yes	yes	yes	yes	yes
Birdwatching	yes	yes	yes	yes	yes
Photography	yes	yes	yes	yes	yes
Interpretive/Educational Activities	yes	yes	yes	yes	yes
Dredge Spoil Disposal (ACOE site)	yes	yes, with a NSA consistency review	yes, with a NSA consistency review	yes, with a NSA consistency review	yes, with a NSA consistency review

- Minimum natural resource standards include:
  - Creating buffer zones around sensitive wildlife and plant species.
  - Protecting riparian areas, wetlands, ponds and lakes. This includes prohibiting any filling or draining of wetlands; creating buffer zones along streams, lakes, ponds, and wetlands; using only native species for revegetation; and providing and maintaining habitat diversity beneficial to the fish, wildlife, and native plants of the Columbia River Gorge.
  - Preserving fish and wildlife habitat. This includes not impeding fish and wildlife passage; timing development during periods when fish and wildlife are least sensitive to activities; and preserving a specified number of trees, snags, and down logs.
  - Maintaining biodiversity by maintaining a minimum oak canopy in areas with existing oak species; maintaining a mix in age and size of hardwoods; and planting only species native to the Columbia River Gorge.
  - Protecting soil productivity by controlling soil movement; minimizing soil disturbance; establishing native ground cover and preventing soil erosion after construction; and maintaining soil organic matter.
  - Protecting air and water quality. This includes maintaining or restoring shoreline stability with vegetation and requiring new development to comply with state water quality requirements.
- A natural resource mitigation plan is required for all new developments or uses proposed within a buffer zone. The plan, prepared by a natural resource specialist, must include existing natural and cultural features, proposed actions within and adjacent to the buffer zone, and mitigation measures. The plan shall be reviewed by the Forest Service, in consultation with appropriate agencies, for compliance.

### ***Management Strategies***

Overall management direction for the Sandy Delta site has been set in the NSA Management Plan. (See Chapter 1.0, Purpose, Need and Related Planning). This section discusses the day-to-day strategies for vegetation management, land use/recreation management, and security/law enforcement/emergency response methods that are common for the three action alternatives. Table 2.3-5 provides a summary of management strategies that would need to be established to implement the alternatives.

Several of the management strategies discussed below are not completely under the control of the FS. For example, ODFW regulates hunting, although the FS can regulate firearms use on National Forest land. Thus, achievement of the desired landscape and recreation pattern will require cooperative implementation of appropriate management strategies among the responsible agencies.



**Vegetation Management.** A Vegetation Management Plan is also needed to control noxious or invasive weeds in order to permit the establishment of desired plant communities in their place. This plan will be adopted to provide guidance in controlling current infestations of noxious and invasive weeds on the 1,400 acres of National Forest land on the Sandy River Delta, and will be based on the *Final Environmental Impact Statement on Managing Competing and Unwanted Vegetation* (FS, 1988), which identifies five strategies for managing competing and unwanted vegetation: prevention, early treatment, maintenance, correction, and no action. Correction, then prevention is the accepted strategy for long-term vegetation management on the Delta.

Central to vegetation management theory, and the basis for deciding on a management strategy, is the establishment of a "damage threshold." The damage threshold identifies the extent measured in terms of areal coverage, bio-mass, etc., of unwanted vegetation above which site management objectives are in jeopardy.

Although damage thresholds have not been established for any of the species currently infesting the Delta, this plan is based on the premise that a corrective action will be required to implement any of the proposed action alternatives.

Objectives of the Delta Vegetation Management Plan include the following:

- empirically establish damage thresholds and action thresholds for reed canarygrass (*Phalaris arundinacea*), Himalayan blackberry (*Rubus discolor*), and other species;
- within 5 years, reduce present populations of noxious or invasive weeds below pre-determined damage threshold levels over 85 percent of the area where they presently exceed the damage threshold;
- create conditions which prevent populations from exceeding damage thresholds in the future;
- establish the landscape patterns identified in the Delta Management Plan; and
- establish a series of experiments in restoration ecology vegetation management to develop the best approach for the site. These experiments could also will have broad applicability to other restoration projects throughout the Pacific Northwest.

Damage threshold levels for reed canarygrass and Himalayan blackberry would be set at ten percent areal coverage per management unit under all alternatives. Threshold levels are set at this low level because of the aggressive, invasive and persistent nature of these two species.

**TABLE 2.3-5**  
**SUMMARY OF MANAGEMENT STRATEGIES**

Management Categories	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5
<i>Vegetation Management</i>					
	Noxious weed control (in accordance with state and federal laws), via continued use of biological agents, but no blackberry or reed canarygrass control	<p>Initial Measures:</p> <ul style="list-style-type: none"> <li>- Herbicides</li> <li>- Grading</li> <li>- Mechanical &amp; hand-removal of unwanted plants</li> <li>- Mowing</li> <li>- Flooding</li> <li>- Manual planting of new plant materials</li> </ul> <p>Ongoing Maintenance:</p> <ul style="list-style-type: none"> <li>- Prescribed fire in certain locations</li> <li>- Mechanical &amp; hand-removal of plants</li> <li>- Biological agents, as needed</li> <li>- Cultural methods</li> <li>- Flooding</li> </ul>	<p>Initial Measures:</p> <ul style="list-style-type: none"> <li>- Grading</li> <li>- Mechanical &amp; hand-removal of unwanted plants</li> <li>- Manual planting of new plant materials</li> <li>- Application of herbicide to kill reed canarygrass &amp; blackberries</li> <li>- Flooding</li> </ul> <p>Ongoing Maintenance:</p> <ul style="list-style-type: none"> <li>- Grazing of upland areas</li> <li>- Mechanical &amp; hand-removal of plants</li> <li>- Biological agents, as needed</li> <li>- Prescribed fire in certain locations</li> <li>- Flooding</li> <li>- Cultural methods</li> <li>- Herbicides</li> </ul>	<p>Initial Measures:</p> <ul style="list-style-type: none"> <li>- Mechanical &amp; hand-removal of unwanted plants</li> <li>- Manual planting of new plant materials</li> <li>- Flooding</li> </ul> <p>Ongoing Maintenance:</p> <ul style="list-style-type: none"> <li>- Hand-removal of unwanted plants</li> <li>- Biological agents, as needed</li> <li>- Mowing/hand-cutting as needed around young plants for 3 to 5 years to permit them to get established</li> <li>- Cultural methods</li> </ul>	<p>Initial Measures:</p> <ul style="list-style-type: none"> <li>- Grading</li> <li>- Mechanical &amp; hand-removal of unwanted plants</li> <li>- Manual planting of new plant materials</li> <li>- Application of herbicide to kill reed canarygrass &amp; blackberries</li> <li>- Flooding</li> </ul> <p>Ongoing Maintenance:</p> <ul style="list-style-type: none"> <li>- Grazing of upland areas</li> <li>- Mechanical &amp; hand-removal of plants</li> <li>- Biological agents, as needed</li> <li>- Prescribed fire in certain locations</li> <li>- Flooding</li> <li>- Cultural methods</li> <li>- Herbicides</li> </ul>
<i>Land Use/Recreation Management</i>					
User Fees	None	Assessed at gateway facility for use of any portion of National Forest land	User fee assessed (at gateway facility) for any use on National Forest land north of I-84	No user fee assessed	User fee assessed for any use on National Forest land north of I-84

Management Categories	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5
<b>Camping</b>	No camping allowed; day uses only	Boat-in or walk-in camping allowed in two designated areas at north end of Sun Dial Island adjacent to boat moorages (with 72-hour stay limitation)	Dispersed camping allowed on National Forest land (with 72-hour stay limitation) outside RIC 4 area	No camping allowed; day uses only	No camping allowed; day use only
<b>Hunting</b>	No change from existing conditions (hunting allowed with firearms restrictions)	No hunting or firearms allowed	Waterfowl hunting only with firearms restrictions	Hunting allowed with firearms restrictions	Waterfowl hunting only with firearms restrictions
<b>Animal Control</b>	No change from existing (dogs allowed without leashes on National Forest land, organized dog training or field trial groups allowed subject to special use permits and firearms restrictions)	Dogs allowed with leashes on National Forest land (organized dog training or field trials not allowed)	Dogs allowed with leashes on National Forest land on Sun Dial Island and vicinity of gateway facility south of I-84; dogs allowed without leashes on National Forest land in Thousand Acres area; organized dog training or field trial groups allowed subject to special use permits and firearms restrictions	Dogs allowed on National Forest land without leashes, except for at gateway kiosk and gateway parking lot where leashes would be required; organized dog training or field trials allowed subject to special use permits and firearms restrictions	Dogs allowed on Sun Dial Island. Leashes would be required at gateway kiosk, parking areas, on trails, and on the Thousand Acres
<b>Special Forest Products</b>	No change from existing--collection allowed for personal use only (currently on honor system)	Collection not allowed in first three years, but after three years it would be allowed for personal use only with permit to be obtained at gateway facility	Collection not allowed in first three years, but after three years it would be allowed for personal use only (honor system)	Collection prohibited	Collection not allowed in first three years, but after three years it would be allowed for personal use only with permit to be obtained at restoration center



Management Categories	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5
<b>Security/Law Enforcement/Emergency Access</b>					
<b>Security/Law Enforcement</b>	No change from existing (regular patrols by Multnomah County Sheriff, Oregon State Police & FS security personnel)	<ul style="list-style-type: none"> <li>- Regular patrols by Multnomah Co. Sheriff, Oregon State Police &amp; FS security personnel</li> <li>- Resident caretaker</li> <li>- Gated access road north of I-84 (locked at night)</li> </ul>	<ul style="list-style-type: none"> <li>- Regular patrols by Multnomah Co. Sheriff, Oregon State Police &amp; FS security personnel</li> <li>- Resident caretaker</li> <li>- Gated access road north of I-84 (locked at night)</li> </ul>	<ul style="list-style-type: none"> <li>- Regular patrols by Multnomah Co. Sheriff, Oregon State Police &amp; FS security personnel</li> <li>- Emergency access only (site closed to vehicles)</li> </ul>	<ul style="list-style-type: none"> <li>- Regular patrols by Multnomah Co. Sheriff, Oregon State Police &amp; FS security personnel</li> <li>- Resident caretaker</li> <li>- Gated access road north of I-84 (locked at night)</li> </ul>
<b>Emergency Access</b>	<ul style="list-style-type: none"> <li>- No change from existing (the following have keys to access the site north of I-84: FS security personnel, Multnomah Co. Sheriff, Troutdale and Gresham Fire Depts, BPA, NWPC</li> <li>- Trailhead facility available for Multnomah County Sheriff's posse</li> <li>- Improved roads would provide primary access</li> <li>- Trails would provide secondary access</li> </ul>	<ul style="list-style-type: none"> <li>- Caretaker; access allowed to FS security personnel, Multnomah Co. Sheriff, Troutdale and Gresham Fire Depts, BPA, NWPC</li> <li>- Improved roads would provide primary access</li> <li>- Trails would provide secondary access</li> </ul>	<ul style="list-style-type: none"> <li>- Caretaker; access allowed to FS security personnel, Multnomah Co. Sheriff, Troutdale and Gresham Fire Depts, BPA, NWPC</li> <li>- Improved roads would provide primary access</li> <li>- Trails would provide secondary access</li> </ul>	<ul style="list-style-type: none"> <li>- FS security personnel, Multnomah Co. Sheriff, Troutdale and Gresham Fire Depts, BPA, NWPC would have keys to access the site north of I-84</li> <li>- Unimproved roads would provide primary access</li> <li>- Additional trails would provide secondary access</li> </ul>	<ul style="list-style-type: none"> <li>- Caretaker; access allowed to FS security personnel, Multnomah Co. Sheriff, Troutdale and Gresham Fire Depts, BPA, NWPC</li> <li>- Improved roads would provide primary access</li> <li>- Trails would provide secondary access</li> </ul>
<b>Mosquito Control</b>					
<b>Mosquito Control</b>	No change in current practice--biological controls on 64 acres	Biological controls on 90 acres	Biological controls on 90 acres	Biological controls on 64 acres	Biological controls on 90 acres

**Noxious Weed Control.** Noxious weeds would be controlled on the site under all of the alternatives. Due to the infestations of reed canarygrass, Himalayan blackberry, as well as the presence of six listed noxious weeds, a corrective action to reduce populations to acceptable levels will be needed in order to achieve any of the landscape patterns under consideration. Once the desired landscape pattern has been established, ongoing vegetation management will be necessary.

Each of the action alternatives proposes a different mix of vegetation management strategies, but the long-term vegetation management goal for all is prevention of future infestations of unwanted and competing vegetation, set at the threshold of ten percent areal coverage.

**Land Use/Recreation Management.** There are no formal recreation facilities on the Delta (north of I-84), but the site is used for a variety of informal recreation, including hunting (predominantly waterfowl), hiking, birdwatching, fishing, horseback riding, mountain bike riding, picnicking, gathering mushrooms and basket materials, and waterplay in the Sandy and Columbia rivers. No surveys of site users have been performed, but many respondents to the scoping notice reported using the site for recreational purposes.

Most of these uses can coexist. However, some forms of potential recreational use of the site would not be consistent with the expected volume of visitors, unless the uses were separated in space or time and carefully regulated. For example, hunting should not occur where people are hiking or picnicking, and the FS currently places restrictions on the types of weapons that may be used on the site, prohibiting rifles and handguns which are most dangerous to other site users.

Management of recreational use of the site to reduce conflicts is proposed for all alternatives, using design, monitoring, and enforcement. Recreational use can also be controlled by controlling access. Limiting the total number of people using the site or limiting the types of uses permitted in some areas may be necessary. The extent of recreational development, and therefore, FS management varies among the alternatives.

As noted earlier, the FS does not regulate hunting or fishing--those activities are the responsibility of the ODFW. However, the FS may restrict the types of weapons used on National Forest lands in order to protect public safety. Hunting regulations will have to be agreed upon in cooperation with ODFW, once a site management plan is adopted.

**Security/Law Enforcement/Emergency Access.** The Sandy River Delta is located on the edge of a major metropolitan area, easily accessible by over a million people. Since the site has been added to National Forest land, FS staff has noted incidents of illegal activity ranging from illegal camping to dumping of stolen vehicles and dead bodies. With any of the alternatives, security and law enforcement arrangements will be necessary to protect site improvements from vandalism and to prevent illegal activity and conflicts among site users.



With increased recreational use of the site, the need for emergency police and fire access would increase. This need will exist with any of the alternatives, but each alternative would require different levels of emergency access.

### *Implementation Considerations*

**Property Exchange or Purchase.** Location of a gateway facility south of I-84 (as shown in Alternatives 3, 4 and 5) would require the FS to acquire some interest in the land from ODOT or OPRD, because the NSA Management Plan specifies that the gateway should be located on National Forest land, and because the FS can spend federal funds only on federal land. Both ODOT and OPRD have indicated a willingness to cooperate with the FS if the gateway is located south of the interstate.

Once an interest in the land is acquired, the FS could construct and operate recreational facilities and a gateway facility without cooperative agreements with other agencies, although there could be cost savings and efficiencies in such arrangements.

**Parking.** If the gateway facility is located south of I-84, as proposed in Alternatives 3, 4 and 5, an agreement to share parking between the gateway and Lewis and Clark State Park would be desirable and would be consistent with NSA Management Plan direction. In addition, by cooperating with OPRD, the cost of maintenance and security could be reduced.

**Vegetation Management.** Implementation of the landscape enhancements and recreation facilities north of the interstate will require the cooperation of DSL, Multnomah County, BPA and NWPC. Agreement will have to be reached among these agencies on the final design of trails, the vegetation management plan, and the final location and design of fishing sites.

**Phasing.** The major components to consider in the phasing of any of the action alternatives include vegetation management/landscape enhancement, recreational improvements, the gateway facility, parking and other support facilities, modifications to the Jordan Road interchange and the location of Jordan Road. It is expected that upon receipt of funding, the vegetation management/landscape enhancement component of the project could be implemented. These activities are intermittent and would not require access improvements. The caretaker's residence could also be constructed to support this activity (but if it is a part of a restoration center or gateway facility, that facility could not be opened until such time as interim access improvements are completed). In addition, the FS could begin to survey special forest products and other "survey and manage species" as required under the ROD for the President's Plan.

Implementation of the other project components (e.g., gateway and recreational improvements) could not be implemented until interim or final access and traffic safety improvements have been completed. This is because existing access off the highway ramps is inadequate. Figure 2.3-10 shows the proposed interim access improvements that would be implemented prior to

complete interchange reconstruction. The proposed interim access would not correct all the safety deficiencies of the interchange or Jordan Road (described in Chapter 1), but would be constructed in accordance with approved ODOT designs.

Construction of the interchange improvements would need to be phased to maintain access to properties south of Broughton Bluff and avoid interrupting rail traffic through the area. If the gateway and recreational facilities are developed before the interchange is completely improved (as seems likely), access to these facilities will also be a factor in phasing interchange construction.

### **2.3.2 Detailed Description of Alternatives**

As noted earlier, landscape characteristics, facilities, permitted uses and management strategies for each alternative are described below and summarized in Tables 2.3-1 through 2.3-5. Figures 2.3-1 through 2.3-5 illustrate the major facilities and habitat types associated with Alternatives 1 through 5. Figures 2.3-6 and 2.3-7 present the two interchange options being considered, and Figures 2.3-8 and 2.3-9 show typical sections for the proposed improvements.

#### ***Alternative 1***

Alternative 1 is the no action alternative. Analysis of the no action alternative is required by NEPA.

**Landscape Patterns.** Historical descriptions and photographs indicate that the delta was mostly forested up to the mid-1900s when the property was cleared for agricultural uses (predominantly cattle grazing). As a result, the majority of the site is classified as upland meadow (approximately 961 acres or 57 percent of the site). Today, it is largely overgrown with invasive non-native species, most prominently reed canarygrass and blackberries (see Figure 2.3-1).

Under this alternative, no landscape enhancement would be implemented. There would be no restoration or enhancement of wetlands, open water, or formerly forested areas. Natural succession would be allowed to occur with minimal FS management. In the short-term, the site would be overgrown with blackberries and reed canary grass, inhibiting recreational use and reducing wildlife values. Eventually, the site would become more forested in character, but that conversion would be a slow process because of the competition from the reed canarygrass and blackberries. It is likely that the resulting forested areas would always have an understory of invasive, non-native plant species.

**Facilities.** No additional facilities or improvements would be provided with this alternative. The western gateway would not be developed in the project area, and, although there would still be a need to modify the Jordan Road interchange to correct safety deficiencies and improve access to the site, traffic and therefore the need for improvements would not be



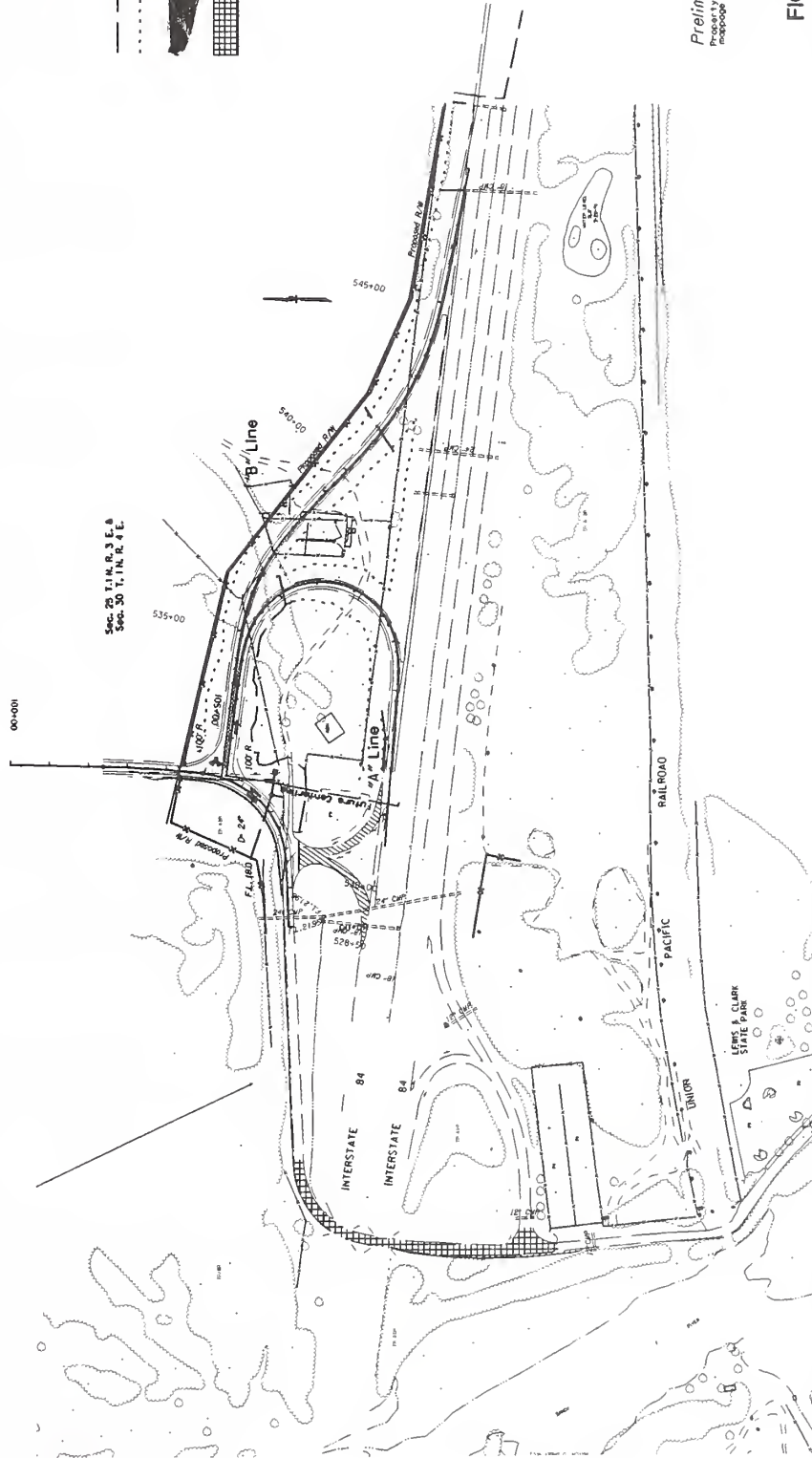
SCALE



Scale - 1" = 300'



--- Toe of Cut Slopes Not Rounded  
- - - - - Toe of Fill Slopes



*Preliminary R/W*  
Property lines were obtained from county GIS  
mappage and should be considered approximate

FIGURE 2.3 - 10  
INTERIM ACCESS PLAN  
SANDY RIVER DELTA PLAN



increased over the current need. Funding and construction of interchange improvements would remain a low priority and would not occur within the foreseeable future.

No alternative site for the gateway is identified, but off-site locations outside the NSA would not be precluded with this alternative.

### **Management Strategies.**

***Vegetation Management.*** With Alternative 1, noxious weed control would be undertaken (such as biological agents for tansy ragwort), in compliance with state and federal law, but no efforts to control the blackberries or reed canarygrass would be undertaken.

***Land Use/Recreational Management.*** Recreational uses would continue to be informal, using existing road and trail networks where these are not overgrown by the blackberries or reed canarygrass. There is no quantified information about the amount and type of use of the site that has occurred since FS acquisition, but use by the public appears to be increasing. Litter and sanitation would continue to be problems in this area.

The same types of hunting now permitted would continue to be permitted over the entire site subject to firearms restrictions. Rifles and handguns would be prohibited, but other forms of hunting could occur. No additional access to the Sandy River would be provided for anglers, but existing informal trails and use would continue. Informal collecting of special forest products (for example, mushrooms, basket materials, etc.) would continue unrestricted and unregulated.

Camping on National Forest land is occurring now, including periodic attempts by groups of homeless people to stay beyond FS permitted limits (14 days in any one location; 28 days cumulative maximum anywhere). Camping would continue to be allowed on National Forest land subject to the existing length-of-stay limitations outside the RIC 4 area, which would continue to be closed to camping. No interpretive or educational facilities would be developed on the site.

***Security/Law Enforcement/Emergency Access.*** Under Alternative 1, the FS would continue to patrol the site to enforce federal regulations (with the support of the Multnomah County Sheriff and Oregon State Police). There would be no regular FS staff presence with this alternative.

The existing system of informal farm roads would continue to provide emergency access to the site. However, as reforestation of the site occurs, access to more remote parts of the site could become more difficult unless trails are periodically cleared. Increasingly, access would have to be by helicopter, boat, horse, bike or foot.



## *Alternative 2*

The future condition achieved under this alternative would emphasize human, recreational use of the site and a diverse landscape.

**Landscape Patterns.** As shown in Figure 2.3-2, Alternative 2 would maximize landscape diversity; providing a mix of habitat types, dominated by upland forest, and with moderate amounts of upland meadow or prairie, upland scrub-shrub, wetland forest/scrub-shrub and wetland meadow. This diverse landscape would offer the greatest variety of experience to recreational users, and this landscape pattern would potentially offer the greatest diversity of wildlife using the site.

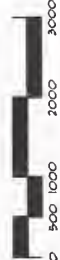
With this alternative, Sun Dial Island would be reforested. Under the BPA power lines, shrubs or small trees (less than 40 feet in height, per BPA vegetation management guidelines) would be planted. An unpaved road would be maintained for access to BPA towers and lines. This would restore the Sun Dial Island subarea to the type of habitat described in the Lewis and Clark journals, that is, low elevation forested riparian habitat. Along the Columbia River, this habitat has been lost due to urbanization and development, construction of the dams which flooded acres of river bottom lowlands, and conversion to other land uses such as agriculture, forest management, and recreation. The reduction of forested riparian habitat is especially pronounced in the Multnomah/Clark counties stretch of the Columbia River.

Under Alternative 2, the Thousand Acres subarea would be more open, with some forested areas along the Sandy River, Columbia River, and the old Sandy River channel slough. This forested riparian habitat would provide shading and habitat features along the water's edge and help control erosion of the shorelines by stabilizing the banks. The small slough on the southeast portion of the Thousand Acres subarea would be deepened and scrub-shrub habitat planted along the edge of the wetland limits to increase breeding habitat for amphibians. In addition, the inverted Y drainage ditches on the east side of Thousand Acres would be graded to widen and flatten the banks to create emergent wet meadow. This would increase habitat for waterfowl, wading and shore birds, and small mammals. The forested areas that exist on the Thousand Acres would be enhanced by removing blackberries from the understory and replanting with native species. The remaining open areas would be upland meadow or prairie.

### **Facilities.**

**Gateway and Support Facilities.** The gateway/caretaker facility would be located north of I-84, on land managed by the FS--in a forested area at the center of the site. This location was chosen because it is above the 100-year flood plain, and is not visible from the I-84. However, good signage would be necessary to ensure that visitors made full usage of the facility. The gateway/caretaker facility would include a multi-purpose meeting room, as well as space for an information desk, interpretive and education displays about the site and Gorge, a restoration work center, FS offices, and caretaker's residence. The facility would be approximately 5,000 square feet in size.

SCALE IN FEET: 1" = 500'



5 ACRE PARCEL



## LEGEND - Alternatives

- PUBLIC VEHICULAR ACCESS
- HIKING, BIKING, & EQUESTRIAN TRAILS
- EASY
- MODERATE TO DIFFICULT
- HIKE ONLY
- HIKE, BIKE
- HIKE, HORSE
- HIKE, BIKE, HORSE

## LEGEND

- SANDY RIVER DELTA STUDY BOUNDARY
- CRNSA BOUNDARY
- STATE BOUNDARY
- UNION PACIFIC RAILROAD
- EASEMENTS

RESTROOM FACILITIES

COLUMBIA RIVER GORGE NATIONAL SCENIC AREA BOUNDARY  
COLUMBIA RIVER

REYNOLDS ALUMINUM PLANT

BARRIER-FREE FISHING SITE

PARKING FOR FISHING ACCESS

25 SPACES

GATEWAY CENTER & CARETAKER'S FACILITY

5,000 S.F.

PORTLAND-TROUTDALE AIRPORT

PARADE DR

INTERSTATE 84

CONNECTION TO 40 MILE LOOP TRAILS

TROUTDALE

HALSEY

LEWIS & CLARK STATE PARK

BUXTON AVE

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RESTROOM FACILITIES

COLUMBIA RIVER GORGE NATIONAL SCENIC AREA BOUNDARY  
COLUMBIA RIVER

REYNOLDS ALUMINUM PLANT

BARRIER-FREE FISHING SITE

PARKING FOR FISHING ACCESS

25 SPACES

GATEWAY CENTER & CARETAKER'S FACILITY

5,000 S.F.

PORTLAND-TROUTDALE AIRPORT

PARADE DR

INTERSTATE 84

CONNECTION TO 40 MILE LOOP TRAILS

TROUTDALE

HALSEY

LEWIS & CLARK STATE PARK

BUXTON AVE

NEW JORDAN RD

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RESTROOM FACILITIES

COLUMBIA RIVER GORGE NATIONAL SCENIC AREA BOUNDARY  
COLUMBIA RIVER

REYNOLDS ALUMINUM PLANT

BARRIER-FREE FISHING SITE

PARKING FOR FISHING ACCESS

25 SPACES

GATEWAY CENTER & CARETAKER'S FACILITY

5,000 S.F.

PORTLAND-TROUTDALE AIRPORT

PARADE DR

INTERSTATE 84

CONNECTION TO 40 MILE LOOP TRAILS

TROUTDALE

HALSEY

LEWIS & CLARK STATE PARK

BUXTON AVE

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RESTROOM FACILITIES

COLUMBIA RIVER GORGE NATIONAL SCENIC AREA BOUNDARY  
COLUMBIA RIVER

REYNOLDS ALUMINUM PLANT

BARRIER-FREE FISHING SITE

PARKING FOR FISHING ACCESS

25 SPACES

GATEWAY CENTER & CARETAKER'S FACILITY

5,000 S.F.

PORTLAND-TROUTDALE AIRPORT

PARADE DR

INTERSTATE 84

CONNECTION TO 40 MILE LOOP TRAILS

TROUTDALE

HALSEY

LEWIS & CLARK STATE PARK

BUXTON AVE

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RESTROOM FACILITIES

COLUMBIA RIVER GORGE NATIONAL SCENIC AREA BOUNDARY  
COLUMBIA RIVER

REYNOLDS ALUMINUM PLANT

BARRIER-FREE FISHING SITE

PARKING FOR FISHING ACCESS

25 SPACES

GATEWAY CENTER & CARETAKER'S FACILITY

5,000 S.F.

PORTLAND-TROUTDALE AIRPORT

PARADE DR

INTERSTATE 84

CONNECTION TO 40 MILE LOOP TRAILS

TROUTDALE

HALSEY

LEWIS & CLARK STATE PARK

BUXTON AVE

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RESTROOM FACILITIES

COLUMBIA RIVER GORGE NATIONAL SCENIC AREA BOUNDARY  
COLUMBIA RIVER

REYNOLDS ALUMINUM PLANT

BARRIER-FREE FISHING SITE

PARKING FOR FISHING ACCESS

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5,000 S.F.

PORTLAND-TROUTDALE AIRPORT

PARADE DR

INTERSTATE 84

CONNECTION TO 40 MILE LOOP TRAILS

TROUTDALE



Composting toilets would be provided, along with a wetland covering approximately three acres to provide final (tertiary) treatment of wastewater from the gateway/caretaker's facility. If demand/usage is higher than projected, a rapid sand distribution system could be used. Otherwise, the gateway center would need to connect to the Lewis and Clark drainfield or the Troutdale system. Restroom facilities with composting toilets would also be provided near the boat moorings on the east side of the Thousand Acres and on the north side of Sun Dial Island.

Water for the gateway would come from a new well near the gateway. Storage for emergencies is not planned.

A modified Jordan Road interchange, in a folded diamond configuration would be provided with this alternative (see Figures 2.3-2 and 2.3-6). Jordan Road would be realigned to the base of Broughton Bluff (crossing I-84 approximately 1,600 feet east of its existing undercrossing. This would provide more direct access from Lewis and Clark State Park to the Sandy River. The "old Jordan Road" undercrossing would be used as a bicycle and pedestrian facility to access the area north of I-84. The I-84 bridges (one in each direction) over the Sandy River would be widened to provide auxiliary lanes between the two interchanges, full shoulders and a bike/pedestrian facility (path).

A new loop access road through the Delta north of I-84 would roughly follow the existing farm road alignments. Parking for approximately 225 cars would be provided north of I-84 at the gateway facility; tucked into the upland forest area to reduce the visual impact. Twenty-five additional parking spaces for anglers would also be constructed between the old and new main Sandy River channels. The equestrian trailhead would have another 25 parking spaces.

***Recreation Facilities.*** This alternative would provide the greatest intensity and variety of recreational improvements of the four alternatives. It would have the longest trail system (between 12 and 15 miles in length) and would provide access to most of the study area. It would connect with the 40-Mile Loop Trail (on the widened I-84 bridge) and Lower Elevation Gorge Trail at the base of Broughton Bluff. Equestrian, mountain bike and hiking uses would be allowed as shown on Figure 2.3-11. Where possible, the proposed trail system design would separate the uses on the loops, and trail users would not be visible to each other. (FS and consultant staff established trail alignments and flagged them in the field. As a result, the proposed trail systems can be constructed and will provide an attractive recreational experience.)

A number of trails including three loop trails are proposed on the Thousand Acres portion of the site with this alternative. The trails incorporate universal design principles, with easiest accessibility in the center of the site near the gateway, moderate accessibility adjacent to that, and the most challenging trails on the outer edges of the site. One trail would provide access for hikers and equestrians out to the area near the two new boat moorings on the east side of the Thousand Acres subarea. Bank stabilization would be required along the Columbia River in this area, along with access paths/stairs. This trail loop would then pass along the southern part of the site, roughly parallel to I-84. Where the trail crosses wetlands, it would be a



boardwalk to avoid fill. The trail could eventually be connected to the regional trail system, via a bike path on the expanded Sandy River Bridge, and possibly, to the east along the freeway to Corbett. Restrooms would be provided to support the boating, dispersed camping, and trail activities on the east side of the Thousand Acres.

Another trail would provide a loop for hiking and mountain biking uses near the slough and northern end of the Thousand Acres. And a third loop would provide a shorter, mostly hiking experience, along the access road to the gateway facility.

Trails are also proposed on the Sun Dial Island portion of the Delta. One trail would provide hiking and equestrian access to the north end of the island. Another trail would provide hiking and mountain biking access to the northwestern end of Sun Dial Island, near where the Sandy River discharges to the Columbia River. Access from Thousand Acres to Sun Dial Island would be across the existing historic dam, which may require alterations for safe and/or barrier-free access. (Alterations to the historic dam would require consultation with the State Historic Preservation Office (SHPO) and federal Advisory Council on Historic Preservation (ACHP).)

As shown on Figure 2.3-2, this alternative would provide an equestrian trailhead facility (an outdoor corral/arena), for riders using the site. The equestrian trailhead facility could also be used by the Sheriff's Posse as a staging area for their patrols.

Picnic sites (with tables and fire pits) would be provided near the gateway facility and parking lots in the area designated for Public Recreation/RIC 4.

### **Management Strategies.**

***Vegetation Management.*** Development and maintenance of the landscape diversity provided in this alternative would require intensive efforts to remove and control unwanted vegetation (reed canarygrass and blackberries) and to maintain diversity. Potential management strategies identified for this alternative include controlled burns, flooding, manual and mechanical control (mowing, hand cutting or digging), chemical control (herbicides) and biological controls (such as the flea beetles now used on the tansy ragwort). Table 2.3-6 shows the acreages of proposed vegetation management techniques for this alternative. Vegetation management strategies are discussed in more detail in Section 3.4.1.

This alternative maintains a large area of upland meadow, requiring a species conversion within this habitat. Extensive use of herbicides, or long-term investments of staff time and labor would be necessary to achieve this. An ongoing maintenance program would be necessary, too.

This alternative would create the greatest amount of wetland meadow habitat, which would be susceptible to re-invasion of reed canarygrass and other weeds such as purple loosestrife. Depending on the extent of invasion, a maintenance program may be needed for the foreseeable future.



**TABLE 2.3-6**  
**ACREAGE OF EACH VEGETATION MANAGEMENT TECHNIQUE**  
**ALTERNATIVE 2**

Habitat Type	Manual	Mechanical						Herbicides	Biological	Fire	Flooding	Grazing
		Mowing		Discing & Plowing	Excavate Concrete	Grading						
		Forest	Grass									
Upland Forest	431	431	360	360	0	0	791	791	0	0	0	
Upland Scrub/Shrub	12	12	212	212	0	0	12	8	0	0	0	
Oak Savannah	0	0	2	2	6	0	2	224	0	0	0	
Wetland Forest	73	73	0	0	0	67	73	190	0	0	0	
Upland Meadow	0	0	267	267	0	0	267	267	88	0	0	
Wetland Meadow	0	0	39	39	0	87	39	171	0	45	0	
Open Water	0	0	0	0	0	0	0	0	0	0	0	
Total Acres	516	516	880	880	6	155	1,184	1,651	88	45	0	

**Land Use/Recreation Management.** As discussed above, this alternative would have the most extensive recreational development and therefore recreation use. However, the proposed design of the trail system would ensure visual separations and, therefore, would provide some level of solitude for users of the site.

Equestrian uses, mountain biking, and hiking would be allowed with this alternative. To reduce conflicts, most trails would be designated for one or two trail uses (hiking only, hiking and biking only, or hiking and equestrian only). Where two or more types of trail uses are allowed along a trail alignment, two parallel but separate trails would be provided. Trails also vary in accessibility, with those nearest the proposed gateway fully barrier-free, while outlying trails are more challenging.

A "no hunting or shooting" policy would be recommended to ODFW because of the potential conflict with the more intensive recreational use of the site.

To avoid overuse, the site would be gated and closed to the public at night, with a resident caretaker to oversee enforcement. A user fee would be assessed at the Gateway for use of any portion of the National Forest land, to offset the cost of facility development and maintenance.

Boat-in or walk-in camping would be allowed in two areas along the Columbia River on the National Forest land. A 72-hour stay limitation would be enforced for the camping use.

**Security/Law Enforcement/Emergency Access.** Alternative 2 would have an on-site caretaker's residence and FS staff stationed at the gateway facility in the center of the site. The caretaker would provide 24-hour security for the Delta, and thus provide earlier detection of problems, with more rapid response potential. The site would be gated and closed to the public at night.

An equestrian trailhead would facilitate the Sheriff's posse patrol, and the extensive trail network would make it easier to access remote parts of the site by trail bike, foot, or emergency vehicle if needed in response to an emergency or law enforcement incident. The trail system proposed under Alternative 2 would be extensive enough to provide vehicular access to most of the site at all times, if the trails are designed and maintained with a 12- to 15-foot clearing width.

### ***Alternative 3***

Alternative 3 emphasizes an open landscape (meadows, prairies, open water) with a moderate amount of recreational development. Some areas would not be accessible by trails. The gateway functions would be split into two facilities to accommodate different user groups.

**Landscape/Wildlife Patterns.** As shown in Figure 2.3-3, Alternative 3 would maximize open areas (meadows, prairies, open water) suitable for use by migratory and breeding waterfowl and herptiles such as the northwestern pond turtle and the red-legged frog. The mix

of forest and open areas could support the reintroduction of Columbia white-tail deer, although the primary wildlife would be waterfowl and herptiles.

As with Alternative 2, water control structures would be added and the inverted Y drainage ditches and remnant slough in the southeastern portion of the Thousand Acres would be graded to distribute the water over a wider area and enhance wetland and open water. Although less of the river shoreline would be reforested than in Alternative 2, shrubs would be planted in most areas to reduce erosion and provide habitat for amphibians.

This alternative would provide a variety of wintering and nesting habitats for migrating waterfowl of the Pacific flyway, complementing and enhancing the ability of Steigerwald National Wildlife Refuge to meet the needs of these species east of the Portland area.

### **Facilities.**

***Gateway and Support Facilities.*** With this alternative, the gateway facility would be approximately 1,500 square feet in size, and would be located south of I-84 on land currently owned by ODOT. The ODOT property is visible from I-84 eastbound, the direction from which most first-time and short-term visitors are expected to arrive. Up to 75 parking spaces would be provided at the gateway and could be shared with Lewis and Clark State Park users. The Gateway would include interpretive displays about the site and Columbia River Gorge.

A caretaker's residence and restoration center would be located north of I-84 on an existing filled area above the 100-year flood level. This facility would not be visible from I-84. One hundred parking spaces would be provided at the restoration center/caretaker's residence for recreational site users. As a result, parking for gateway functions would be separated from on-site recreation users.

Composting toilets and a treatment wetland would be provided to treat the wastewater from the caretaker's residence and restoration facility. Wastewater from the gateway facility would be treated in an on-site septic system, or could be connected to the Troutdale system, either at the existing connection across the HCRH bridge, or possibly through a new connection using the widened I-84 bridge structures. Water for the restoration center and caretaker would come from a new well. Water for the gateway could come from the Lewis and Clark State Park or a new well.

As with Alternative 2, access to the site would be provided by a modified interchange in a folded diamond configuration. Jordan Road would be realigned to the base of Broughton Bluff (crossing under I-84 approximately 1,600 feet east of its current undercrossing. This would provide more direct access from Lewis and Clark State Park to the Sandy River. The "old Jordan Road" undercrossing would be used as a bicycle and pedestrian facility to access the area north of I-84 and the Sandy River. The I-84 bridges over the Sandy River would be widened to provide auxiliary lanes between the two interchanges, full shoulders and a bike/pedestrian facility (path).

***Recreation Facilities.*** This alternative has a moderate level of recreation improvements. Between 7 and 9 miles of trails would be provided in this alternative, including trails on Sun Dial Island, the Thousand Acres, and connecting the site to the 40-Mile Loop Trail and the Lower Elevation Gorge Trail. As shown on Figure 2.3-12, hiking and biking would be permitted on the site, but no horseback riding. (There is no equestrian trailhead in this alternative.) Where possible, these trail uses would be separated. Trail design includes easy accessibility adjacent to the caretaker's residence and restoration center, moderately difficult trails beyond those, and challenging trails on the outskirts of the site.

Picnic sites (tables and fire pits) would be provided in the area designated for public recreation RIC 4, south of I-84 adjacent to the gateway.

No additional river access points would be provided, nor would restrooms be provided to serve the existing boat mooring on the east side of the site adjacent to Gary and Flag islands. Dispersed camping would still be permitted, however, no restrooms or new boat access facilities would be provided to support it.

### **Management Strategies.**

***Vegetation Management.*** This alternative would require species conversion within a large area of upland meadow and the also conversion to wetland meadow. In order to create the open water areas, grading and construction of hydrologic control features would be necessary. An initial application of herbicides would be required to control the reed canarygrass and permit native meadow species to become established. Maintenance of the open character of the site would require regular management, possibly including grazing, mowing, hand cutting or digging brush, controlled burns, flooding, and periodic application of herbicides. Table 2.3-7 shows the acreages for which each vegetation management strategy is proposed.

***Land Use/Recreation Management.*** Hiking and mountain bike riding would be permitted, but no horseback riding. Trails would be designated for hiking and biking or hiking only; and a single trail would be designed for both uses, since fewer users would be expected. Varying levels of trail accessibility would also be available, with a loop trail near the caretaker's residence/restoration center fully barrier-free.

Fishing would continue, but the FS would limit access points to the river in order to prevent and repair the bank erosion that is currently occurring as a result of informal use.

User fees would be charged at the gateway for use of National Forest land north of I-84. There would be no user fee for the gateway itself. On-site educational/interpretive facilities/signs would emphasize the creation and maintenance of the open habitat, and efforts at wetlands creation and enhancement in the Delta environment. Seasonally, at least a portion of the site would be reserved for waterfowl hunters, subject to weapons restrictions. Trails have been designed to facilitate separation of hunters and other uses.



SCALE IN FEET: 1" = 500'



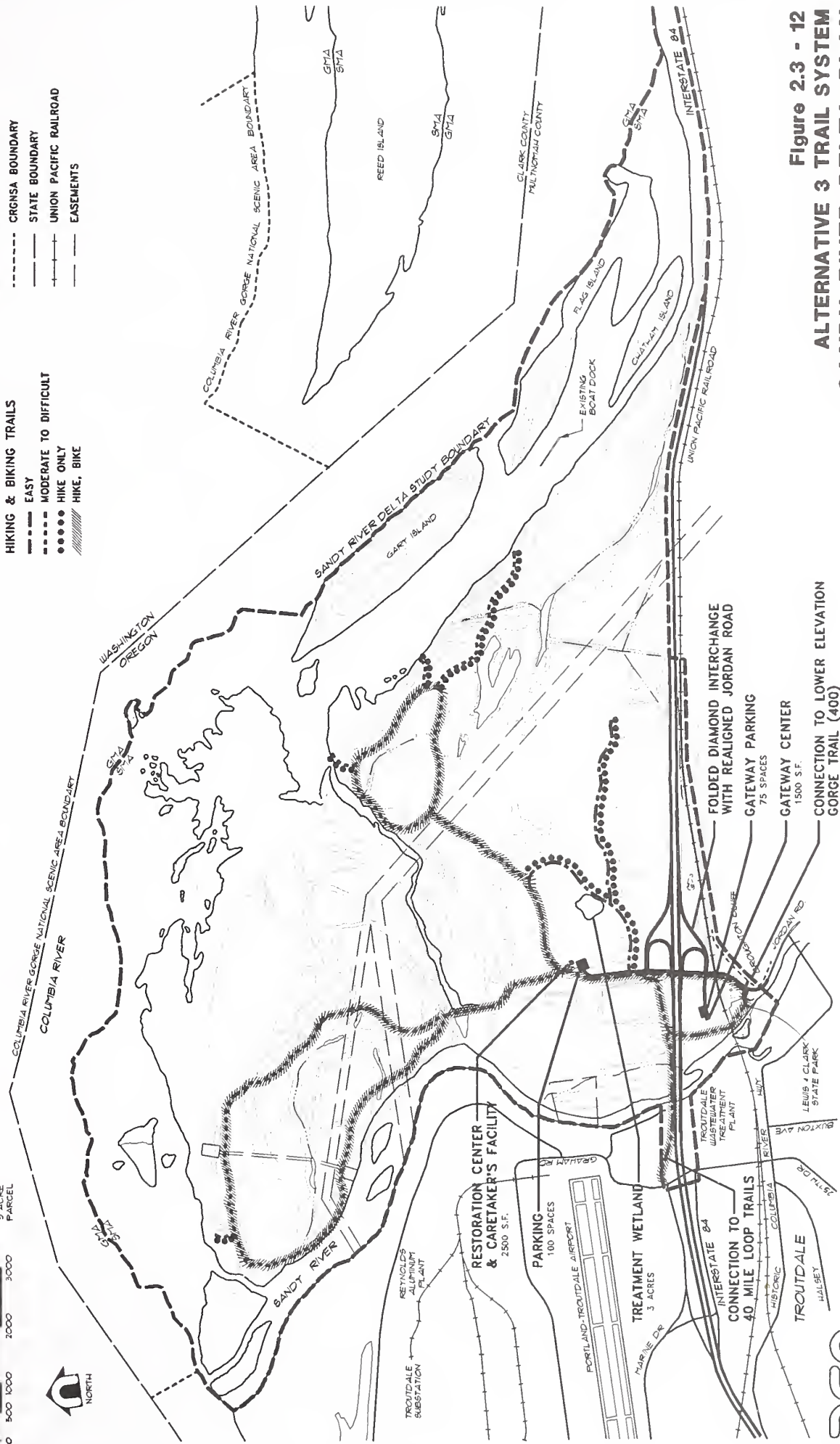
1/4 ACRE  
PARCEL



### LEGEND

### LEGEND - Alternatives

- PUBLIC VEHICULAR ACCESS
- HIKING & BIKING TRAILS
- EASY
- MODERATE TO DIFFICULT
- HIKE ONLY
- HIKE, BIKE
- SANDY RIVER DELTA STUDY BOUNDARY
- CRONSA BOUNDARY
- STATE BOUNDARY
- UNION PACIFIC RAILROAD
- EASEMENTS



**Figure 2.3 - 12**  
**ALTERNATIVE 3 TRAIL SYSTEM**  
**SANDY RIVER DELTA PLAN**  
Columbia River Gorge National Scenic Area





**TABLE 2.3-7**  
**ACREAGE OF EACH VEGETATION MANAGEMENT TECHNIQUE**  
**ALTERNATIVE 3**

Habitat Type	Manual	Mechanical						Herbicides	Biological	Fire	Flooding	Grazing
		Mowing		Discing & Plowing	Excavate Concrete	Grading						
		Forest	Grass									
Upland Forest	431	431	11	11	0	0	442	442	0	0	0	0
Upland Scrub/Shrub	12	12	36	36	0	0	48	8	0	0	0	0
Oak Savannah	0	0	2	2	6	0	0	48	0	0	0	0
Wetland Forest	73	73	0	0	0	32	105	155	0	0	0	0
Upland Meadow	0	0	741	741	0	0	741	741	245	0	245	245
Wetland Meadow	0	0	34	34	0	58	97	142	0	30	0	0
Open Water	0	0	0	0	0	65	0	0	0	0	0	0
Total Acres	516	516	824	824	6	155	1,433	1,536	245	30	245	245

Dispersed camping (without developed facilities) would be allowed anywhere within National Forest land on the site. A 72-hour stay limitation would be enforced for the camping use.

***Security/Law Enforcement/Emergency Access.*** Alternative 3 would limit parking and therefore vehicular access north of I-84. The National Forest land would be gated and a caretaker would provide on-site security. The limited vehicular access and reduced recreational development would reduce the number and type of uses and thus possibly reduce the number of security/law enforcement incidents compared to Alternative 2.

The moderate-length trail system proposed under Alternative 3 would provide vehicular access to the BPA and NWPC facilities, but not to the more remote parts of Sun Dial Island or Thousand Acres. However, under this alternative, the landscape would be predominantly open meadow, and it would be possible to access most of the site by vehicle by driving cross-country. The open landscape would also make it easier to detect problems and respond to them quickly. Boats or helicopters could be used in emergencies.

#### ***Alternative 4***

Alternative 4 would return the site, as closely as possible, to historic conditions. The DFC would be primarily riparian forested river bottomlands, which would provide habitat that has largely been eliminated by damming of the Columbia River and urban development in the Portland/Vancouver area. Alternative 4 would have minimal recreation development and no trail access to Sun Dial Island. Vehicular access north of I-84 would be limited to emergencies.

***Landscape/Wildlife Patterns.*** Alternative 4 would restore the delta to conditions closer to those existing at the time of early European exploration. The journals of the Lewis and Clark expedition, and early Government Land Office maps indicate that the delta was originally forested, with openings where wetland meadows and lakes were found. This alternative would emphasize establishment of a riparian forest with openings for ponds and sloughs. Recreation use would be limited. The vegetation pattern for this alternative would be more forested--although scrub-shrub or meadow vegetation would remain in the BPA and NWPC rights-of-way, and wetlands adjacent to I-84 (see Figure 2.3-4), which represent 39.5 percent of the site.

The forest would initially be predominantly deciduous trees such as the cottonwoods, ash, and willows which occur naturally on the site now, but ultimately there would be more conifers (e.g. grand fir) on the higher (and drier) ground. The site will not support a dense forest cover. There would continue to be small meadows and clearings in the forest canopy. Scrub-shrub vegetation would be introduced under the power lines (consistent with BPA and NWPC management direction) and in the wet area in the south-central portion of the site. After an initial control effort, this alternative would require the least ongoing investment in vegetation management.

A more forested habitat pattern could support the re-introduction of Columbia white-tailed deer, western pond turtles, yellow-bill cuckoo, and bald eagles. Under this alternative, hunting would be permitted throughout the site, with weapons restrictions. If the Columbia white-tailed deer were reintroduced to the site, a management plan acceptable to USFWS would have to be developed. Some control of the existing black-tail deer populations would be necessary, most likely by hunting.

### **Facilities.**

***Gateway and Support Facilities.*** This alternative minimizes development on the site. There would be no vehicular access to National Forest land north of the highway, other than emergency and FS, BPA, and NWPC maintenance vehicles. No parking would be provided north of I-84.

Under this alternative, the "gateway facility" would be an unstaffed information kiosk located on land currently owned by ODOT, south of I-84. Interpretive facilities would be limited to signs and brochures at the kiosk focusing on the Gorge and NSA. The ODOT property is visible from I-84 eastbound, the direction from which most first-time and short-term visitors are expected to arrive. The kiosk could be compatible with development of a larger tourist facility off-site. Parking for up to 75 vehicles would be provided at this site, although fewer may be needed for a minimal facility such as the information kiosk. Parking could be shared with river users and Lewis and Clark State Park.

A modified Jordan Road interchange, in a diamond configuration, would provide access to the site. Jordan Road would not be realigned in this alternative, it would be extended from the new interchange and cross the UPRR at its existing location. The undercrossing would, however, require some improvements to improve sight distance as the road curves under the UPRR next to the Sandy River. The I-84 bridges (one in each direction) over the Sandy River would be widened to provide auxiliary lanes between the two interchanges, full shoulders and a bike/pedestrian facility (path).

***Recreation Facilities.*** The existing Jordan Road alignment would become the trail access to the area north of I-84. The developed trail network would be between 4 and 6 miles, and would be located only on the Thousand Acres portion of the Delta. It would connect to the 40-Mile Loop Trail and Lower Elevation Gorge Trail. The only access to the Sun Dial Island would be via the existing access road, which would be gated, and there would be no developed trails to the Columbia River shore on the north or east side of the site. As shown on Figure 2.3-13, trail use north of I-84 would be limited to hiking; no mountain bike or equestrian uses would be allowed.

Picnic facilities would be provided near the information kiosk and parking lot south of I-84. No additional facilities (e.g., restrooms, stairways, etc.) to support boat access, fishing or camping would be developed under this alternative.

### **Management Strategies.**

***Vegetation Management.*** Achieving this forested pattern would require hand clearing and planting some trees initially, removing competing vegetation around the saplings for the first few years, and possibly replacing those lost to disease and predation over time. Flooding would be used in sloughs and depressions where an adequate water source could be found. The need for and cost of vegetation management would be reduced after the trees were established. Table 2.3-8 shows the acreage of each proposed vegetation management strategy.

***Land Use/Recreation Management.*** Trail use would be limited to hiking; no bicycling or equestrian use would be allowed. Enforcement of these restrictions may require additional patrols by FS staff. All camping would be prohibited. Trails vary in design accessibility with the easiest trails adjacent to the National Forest land access and most difficult trails along the edges of the slough and river.

***Security/Law Enforcement/Emergency Access.*** Alternative 4 would restrict vehicular access to National Forest land to service and emergency vehicles and BPA or NWPC maintenance vehicles. The site would be gated and closed to the public at night. No caretaker's residence is proposed for the site, and site security would be provided by a combination of periodic FS, Multnomah County Sheriff and Oregon State Police patrols, as currently occurs.

Because the site would be more forested than the other alternatives, it could be more difficult to detect problems encountered or created by recreational users of the site, and more difficult to reach them in the event of an emergency. This would be particularly the case for people who hike or boat in to Sun Dial Island. As a result, response times would be longer, and access might require use of a helicopter or boat.

### ***Alternative 5***

Alternative 5 would combine an open landscape (meadows, prairies, open water) on the Thousand Acres with a reforested Sun Dial Island. It also proposes a moderate amount of recreational development. Some areas would not be accessible by trails. The gateway function would be filled by a kiosk located south of I-84 with a restoration center and caretaker's residence on the Thousand Acres. Alternative 5 is the FS preferred alternative.



SCALE IN FEET: 1" = 500'



5 ACRE  
PARCEL



## LEGEND - Alternatives

- PUBLIC VEHICULAR ACCESS
- HIKING TRAILS
- EASY
- MODERATE TO DIFFICULT
- HIKE ONLY
- HIKE, BIKE

## LEGEND

- SANDY RIVER DELTA STUDY BOUNDARY
- CRGNSA BOUNDARY
- STATE BOUNDARY
- UNION PACIFIC RAILROAD
- EASEMENTS

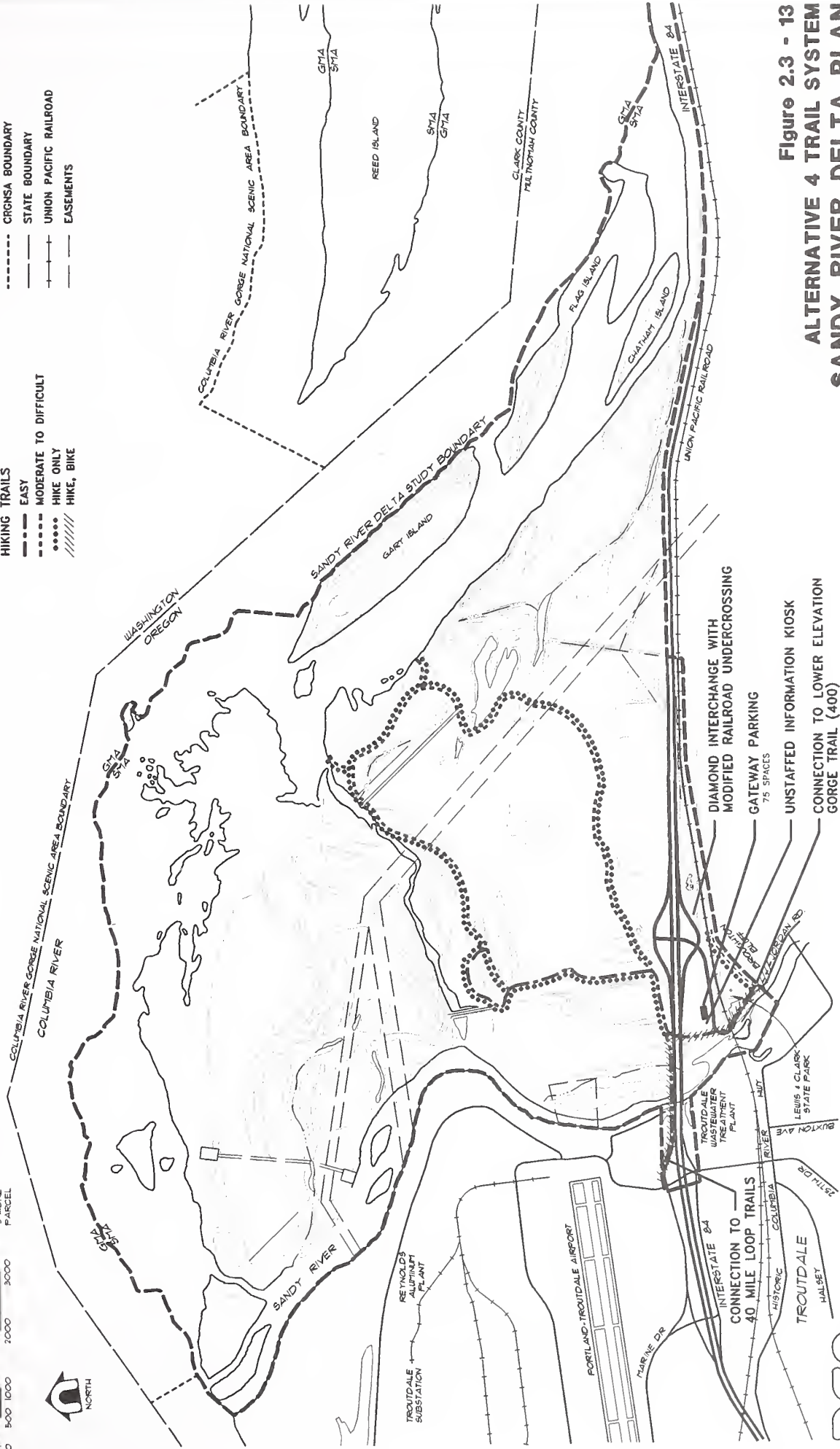


Figure 2.3 - 13

## ALTERNATIVE 4 TRAIL SYSTEM

## SANDY RIVER DELTA PLAN

Columbia River Gorge National Scenic Area



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**TABLE 2.3-8**  
**ACREAGE OF EACH VEGETATION MANAGEMENT TECHNIQUE**  
**ALTERNATIVE 4**

Habitat Type	Manual	Mechanical						Herbicides	Biological	Fire	Flooding	Grazing
		Mowing		Discing & Plowing	Excavate Concrete	Grading						
		Forest	Grass									
Upland Forest	431	431	561	562	0	0	0	992	0	0	0	
Upland Scrub/Shrub	12	12	215	215	0	0	0	10	0	0	0	
Oak Savannah	0	0	2	2	6	0	0	227	0	0	0	
Wetland Forest	73	73	0	0	0	168	0	291	0	0	0	
Upland Meadow	0	0	5	5	0	0	0	5	0	0	0	
Wetland Meadow	0	0	32	32	0	0	0	77	0	20	0	
Open Water	0	0	0	0	0	25	0	0	0	0	0	
Total Acres	516	516	815	816	6	193	0	1,602	0	20	0	

**Landscape/Wildlife Patterns.** As shown in Figure 2.3-5, Alternative 5 would maximize open areas (meadows, prairies, open water) suitable for use by migratory and breeding waterfowl and herptiles such as the northwestern pond turtle and the red-legged frog on the Thousand Acres. Wetlands enhancement and creation of seasonal areas of open water would be achieved using methods described in Alternative 3. Sun Dial Island would have a forested habitat with scrub/shrub in the BPA right-of-way, similar to Alternative 2. Initially the forest would be deciduous trees, but eventually drier areas could support conifers such as grand fir. The mix of forest and open areas could support the reintroduction of Columbia white-tail deer, although the primary wildlife would be waterfowl and herptiles.

This alternative would provide a variety of wintering and nesting habitats for migrating waterfowl of the Pacific flyway, complementing and enhancing the ability of Steigerwald National Wildlife Refuge to meet the needs of these species east of the Portland area. It would also enhance foraging habitat for bald eagles with the enhanced forest along the Columbia River.

#### **Facilities.**

***Gateway and Support Facilities.*** With this alternative, the gateway facility would be a kiosk located south of I-84 on land currently owned by ODOT. The ODOT property is visible from I-84 eastbound, the direction from which most first-time and short-term visitors are expected to arrive. Up to 75 parking spaces would be provided at the gateway and could be shared with Lewis and Clark State Park users. The gateway would include interpretive displays about the site and the Columbia River Gorge.

A caretaker's residence and restoration center would be located north of I-84 in an area above the 100-year flood level. This facility would not be visible from I-84. One hundred parking spaces would be provided at the restoration center/caretaker's residence for recreation site users. As a result, gateway functions would be separated from on-site recreation users.

Composting toilets and a treatment wetland would be provided to treat the wastewater from the caretaker's residence and restoration facility. Water for the restoration center and caretaker would come from a new well.

As with Alternative 2 and 3, access to the site would be provided by a modified interchange in a folded diamond configuration. Jordan Road would be realigned to the base of Broughton Bluff (crossing under I-84 approximately 1,600 feet east of its current undercrossing. This would provide more direct access from Lewis and Clark State Park to the Sandy River. The "old Jordan Road" undercrossing would be used as a bicycle and pedestrian facility to access



SCALE IN FEET: 1" = 600'



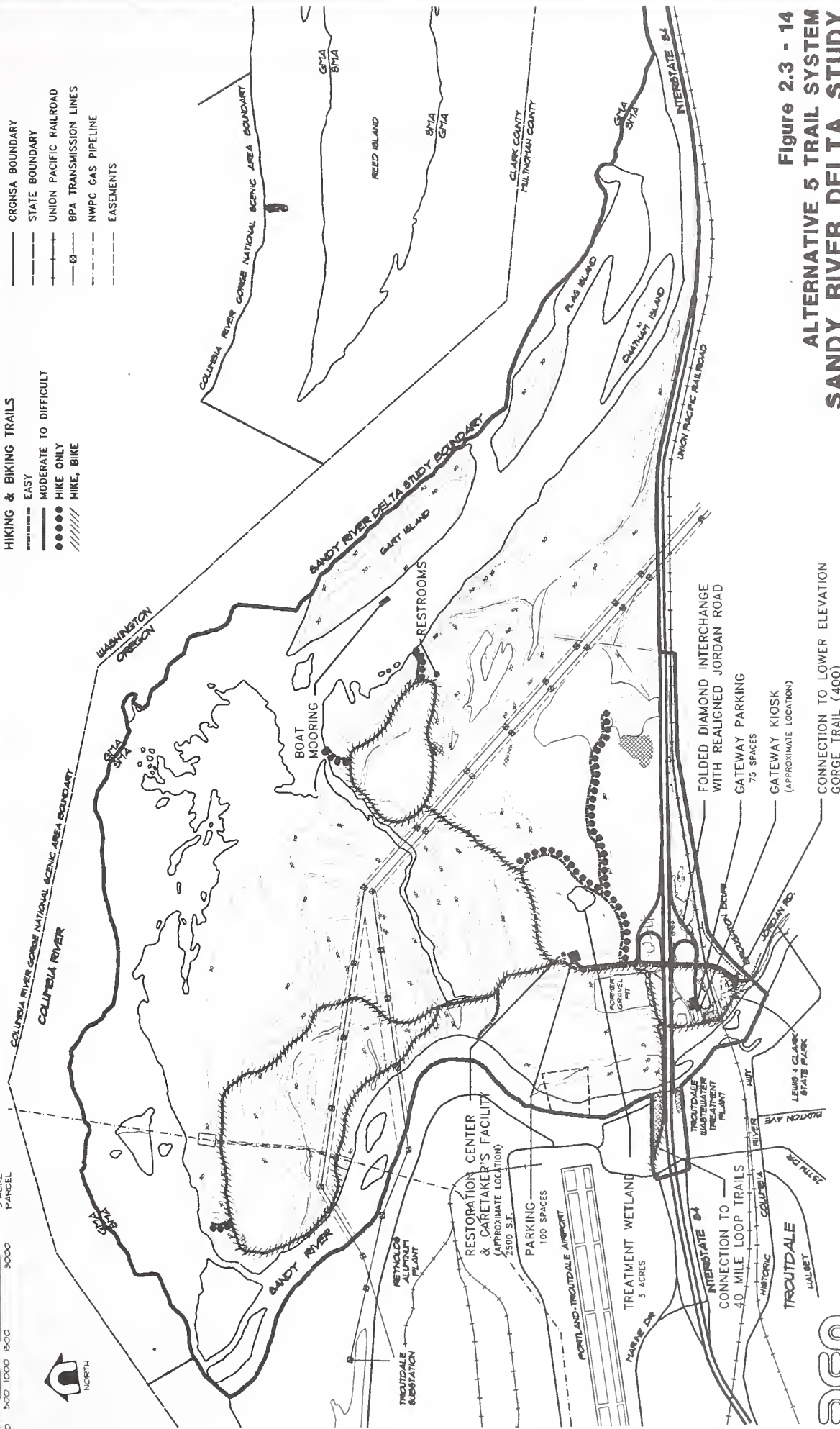
5 ACRE PARCEL

## LEGEND - Alternatives

- PUBLIC VEHICULAR ACCESS
- HIKING & BIKING TRAILS
- EASY
- MODERATE TO DIFFICULT
- HIKE ONLY
- HIKE, BIKE

## LEGEND

- SANDY RIVER DELTA STUDY BOUNDARY
- CRGSA BOUNDARY
- STATE BOUNDARY
- UNION PACIFIC RAILROAD
- BPA TRANSMISSION LINES
- NWPC GAS PIPELINE
- EASEMENTS



**Figure 2.3 - 14**  
**ALTERNATIVE 5 TRAIL SYSTEM**  
**SANDY RIVER DELTA STUDY**  
 Columbia River Gorge National Scenic Area

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10/22/94





the area north of I-84 and the Sandy River. The I-84 bridges over the Sandy River would be widened to provide auxiliary lanes between the two interchanges, full shoulders and a bike/pedestrian facility (path).

***Recreation Facilities.*** This alternative also has a moderate level of recreation improvements. Between 7 and 9 miles of trails would be provided in this alternative, including trails on Sun Dial Island, the Thousand Acres, and connecting the site to the 40-Mile Loop Trail and the Lower Elevation Gorge Trail. The trail system is similar to Alternative 3. As shown on Figure 2.3-14 hiking and biking would be permitted on the site, but no horseback riding. (There is no equestrian trailhead in this alternative.) Where possible, these trail uses would be separated. Trails would offer a variety of accessibility--from easy to challenging.

The existing boat mooring would be moved north, adjacent to Gary Island. No additional river access points would be provided. Restrooms would be provided to serve the boat mooring and trail uses on the east side of the site. No camping would be permitted north of I-84.

### **Management Strategies.**

***Vegetation Management.*** This alternative would require species conversion within a large area of upland meadow and the also conversion to wetland meadow. In order to create the open water areas, grading and construction of hydrologic control features would be necessary. An initial application of herbicides would be required to control the reed canarygrass and permit native meadow species to become established. Maintenance of the open character of the site would require regular management, possibly including grazing, mowing, hand cutting or digging brush, controlled burns, flooding, and periodic application of herbicides. Table 2.3-9 shows the acreage of each proposed vegetation management strategy.

Vegetation management on Sun Dial Island would be similar to Alternative 4; that is, selective clearing to permit saplings to become established and use of hand cutting, mowing, flooding, and cultural methods for ongoing control.

***Land Use/Recreation Management.*** Hiking and mountain bike riding would be permitted, but no horseback riding. Trails would be designated for hiking and biking or hiking only; and a single trail would be designed for both uses, since fewer users would be expected. Varying levels of trail accessibility would also be available, with a loop trail near the caretaker's residence/restoration center fully barrier-free.

Fishing would continue, but the FS would limit access points to the river in order to prevent and repair the bank erosion that is currently occurring as a result of informal use.

**TABLE 2.3-9**  
**ACREAGE OF EACH VEGETATION MANAGEMENT TECHNIQUE**  
**ALTERNATIVE 5**

Habitat Type	Manual	Mechanical						Herbicides	Biological	Fire	Flooding	Grazing
		Mowing		Discing & Plowing	Excavate Concrete	Grading						
		Forest	Grass									
Upland Forest	431	431	175	175	0	0	405	606	0	0	0	
Upland Scrub/Shrub	12	12	194	194	0	0	80	8	0	0	0	
Oak Savannah	0	0	2	2	6	0	0	206	0	0	0	
Wetland Forest	73	73	0	0	0	75	20	198	0	0	0	
Upland Meadow	0	0	398	398	0	0	398	398	130	0	130	
Wetland Meadow	0	0	39	39	0	43	80	129	0	30	0	
Open Water	0	0	0	0	0	62	0	0	0	0	0	
Total Acres	516	516	808	808	6	180	983	1,545	130	30	130	

User fees would be charged for use of National Forest land north of I-84. Seasonally, at least a portion of the site would be reserved for waterfowl hunters, subject to weapons restrictions. Trails have been designed to facilitate separation of hunters and other uses. Dispersed camping would not be allowed north of I-84.

***Security/Law Enforcement/Emergency Access.*** Alternative 5 would limit parking and therefore vehicular access north of I-84. The National Forest land would be gated and a caretaker would provide on-site security. The limited vehicular access and reduced recreational development would reduce the number and type of uses and thus possibly reduce the number of security/law enforcement incidents compared to Alternative 2.

The moderate-length trail system proposed under Alternative 5 would provide vehicular access to the BPA and NWPC facilities, but not to the more remote parts of Sun Dial Island or Thousand Acres. However, under this alternative, the open landscape on the Thousand Acres would make it possible to access most of the subarea by vehicle by driving cross-country. The open landscape would also make it easier to detect problems and respond to them quickly. Boats or helicopters could be used to reach remote parts of Sun Dial Island.

## **2.4 COST ESTIMATE**

For each action alternative, cost estimates were prepared for all initial project implementation, including vegetation management activities and construction of the gateway and support facilities, recreation facilities, and the interchange and Jordan Road modifications. These cost estimates include overhead and profit costs; plus design and contingencies which were estimated as a percentage of the initial costs.

Annual operation and maintenance (O&M) cost estimates were also prepared for each alternative, including Alternative 1, the no action alternative. Estimates were made for gateway staffing and/or restoration center/caretaker staffing and O&M, interpretive materials, trail maintenance, road and parking lot maintenance, restroom maintenance, law enforcement, on-going vegetation management and resource monitoring. Overhead and administration costs were assumed to be a percentage of the annual O&M cost, and were also included in the estimate.

These costs estimates were prepared to provide a general comparison of costs between alternatives. However, predicting these costs, especially those for on-going vegetation management, is difficult because the success of the initial implementation is not known. Landscape restoration on this scale has not been attempted before. While per acre costs can be developed, it is difficult to predict how many acres of treatment will be necessary, particularly for herbicide application and hand pulling. The cost estimates for vegetation management assume certain acreages will be treated each year, but actual treated acres may vary.

Table 2.4-1 presents a summary of the estimated initial project and O&M costs for each alternative. In addition, it presents the average annual number of people estimated to visit the site and the cost per visitor. Table 2.4-2 displays the initial implementation costs for major items and Table 2.4-3 shows the breakdown of O&M costs. The FS anticipates establishing partnerships with other agencies and organizations to fund the work.

**TABLE 2.4-1  
ESTIMATED COSTS FOR EACH ALTERNATIVE<sup>1</sup>**

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Initial Project Cost <sup>2</sup>	\$0	\$27,083,000	\$23,222,000	\$19,265,000	\$22,724,300
Annual O&M Cost <sup>2</sup>	\$3,400	\$756,000	\$711,000	\$567,000	\$666,000
Estimated Annual Visitors <sup>3</sup>	286,000	1,518,000	1,343,000	964,000	1,196,000
Initial Project Cost per Visitor	\$0	\$18	\$17	\$20	\$19
O&M Cost per Visitor	\$.01	\$.50	\$.53	\$.59	\$.56
O&M Cost per Acre <sup>4</sup>	\$1.50	\$302	\$284	\$227	\$264

<sup>1</sup> Cost calculation worksheets on file at CRGNSA office in Hood River, Oregon.

<sup>2</sup> In 1995 dollars. O&M cost estimate does not include O&M for Lewis and Clark State Park.

<sup>3</sup> Derived from estimated 1998 projections for Sandy River Delta study area, reduced to 1995 values for use with 1995 dollars; plus 255,000 total annual visitors to Lewis and Clark State Park (for period from July 1993 to June 1994).

<sup>4</sup> Based on 2,500 acres, including all land and water areas within study area.

**TABLE 2.4-2  
BREAKDOWN OF INITIAL IMPLEMENTATION COSTS<sup>1</sup>**

CATEGORY	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5
Vegetation Management	\$6,415,500	\$5,289,000	\$5,775,000	\$6,267,000
Gateway/ Restoration Center	\$3,325,500	\$2,194,500	\$378,000	\$672,000
Recreation	\$3,067,500	\$1,464,000	\$645,000	\$1,510,500
Interchange & Jordan Road	\$14,274,800	\$14,274,800	\$12,466,800	\$14,272,800
<b>TOTAL</b>	<b>\$27,083,300</b>	<b>\$23,222,300</b>	<b>\$19,264,800</b>	<b>\$22,724,300</b>

<sup>1</sup> Cost calculation worksheets on file at CRGNSA office in Hood River, Oregon. All costs in 1995 dollars.



**TABLE 2.4-3  
BREAKDOWN OF OPERATIONS & MAINTENANCE COSTS<sup>1</sup>**

<i>CATEGORY</i>	<i>ALT. 1</i>	<i>ALT. 2</i>	<i>ALT. 3</i>	<i>ALT. 4</i>	<i>ALT. 5</i>
Gateway	- 0 -	\$90,000	\$75,000	- 0 -	- 0 -
Restoration Center/Caretaker	- 0 -	\$25,000	\$30,000	- 0 -	\$30,000
Vegetation Management	\$500	\$497,800	\$467,250	\$466,130	\$511,300
Other	\$2,400	\$33,300	\$35,500	\$18,400	\$27,600
Overhead/Admin	\$493	\$109,837	\$103,318	\$82,370	\$96,713
<b>TOTAL</b>	<b>\$3,393</b>	<b>\$755,937</b>	<b>\$711,068</b>	<b>\$566,900</b>	<b>\$665,613</b>

<sup>1</sup> Cost calculation worksheets on file at CRGNSA office in Hood River, Oregon. All costs in 1995 dollars. Excludes O&M costs for Lewis and Clark State Park.

## **2.5 SUMMARY OF EFFECTS ON KEY ISSUES**

Implementation of any of the proposed action alternatives would have beneficial effects on the use, appearance, and functioning of the area. The alternatives differ in the amount of improvement over existing conditions, and the balance between proposed uses of the site. Table 2.5-1 summarizes the expected effects of each alternative on the key issues identified during scoping.

**TABLE 2.5-1**  
**SUMMARY OF EFFECTS ON KEY ISSUES**

ISSUE	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5
<b>Traffic/Circulation/Access</b>					
How will safe access be provided, and what will be the effects of access improvements?	No access improvements would be made, so there would be no effects, but existing problems will continue	Folded diamond interchange and realigned Jordan Rd. would meet ODOT safety and LOS standards. Less than 1 acre of wetlands affected. New undercrossing of historic ORNC rail line would be needed	Same as Alternative 2	Diamond interchange and realigned Jordan Rd. would meet ODOT safety and LOS standards. Less than 1 acre of wetlands affected. New undercrossing of UPRR would require filling up to 50 feet out into the Sandy River. Use of a retaining wall to minimize fill is proposed. Realigned Jordan Road crosses Section 6(f) resources	Same as Alternative 2
How will access to open space lands be controlled to meet SMA standards?	No access control would be imposed	A user fee would be charged at the gateway for all uses of National Forest land; area north of I-84 will be gated	Same as Alternative 2	Use would be controlled by limiting parking and trails. No user fee would be imposed	Same as Alternative 2
How will river access be provided and riparian habitat protected?	River access would occur along informal trails	12-15 miles of improved trails would direct access to Sandy & Columbia Rivers to appropriate locations. Barrier-free fishing site would be built on Sandy River	7-9 miles of improved trails would direct access to appropriate locations on Sandy & Columbia	No additional Sandy River access north of I-84. 4-6 miles of new trails would be located in the center of the site	7-9 miles of improved trails would direct access to appropriate locations on the Sandy & Columbia. Includes new fishing access trail to Sandy River
What will be the impact on parking for Lewis & Clark State Park?	No change from existing conditions.	275 parking spaces would be provided north of I-84. Realigning Jordan Road would remove access to gravel parking area between UPRR and I-84.	100 parking spaces would be provided north of I-84. The existing gravel parking area would be removed and replaced with a paved parking lot for 75 vehicles.	No parking north of I-84. The existing gravel parking area would be removed and replaced with a paved parking lot for 75 vehicles.	Same as Alternative 3.

ISSUE	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5
<b>Size and Location of Gateway Facilities</b>					
Where should the Gateway be located?	No Gateway would be built. This would not meet NSA Management Plan guidelines	The Gateway would be built on National Forest land designated for Public Recreation north of I-84. It would not be visible from I-84	The Gateway would be built south of I-84, on land owned by ODOT and OPRD, and designated for Public Recreation in the NSA Management Plan. It would be visible and readily accessible from I-84	Same as Alternative 3	Same as Alternative 3
What functions should the Gateway facility incorporate?	There would be no gateway under this alternative	The Gateway would include a staffed information desk, a restoration center, meeting rooms, interpretive displays, and support facilities (restrooms, picnic tables, etc.)	The Gateway would include a staffed information desk, interpretive displays, and support facilities. The restoration center would be located with the caretaker's house, separate from the Gateway	The Gateway would be an unstaffed kiosk with interpretive information but no support facilities	Same as Alternative 4. The restoration center would be the same as Alternative 3
How will Gateway usage be controlled to meet NSA Management Plan standards?	There would be no gateway in this alternative	Parking would be limited to 225 spaces at the Gateway. A user fee would be assessed for all uses of National Forest Land north of I-84	Parking would be limited to 75 spaces adjacent to the Gateway. A user fee would be charged for all uses of National Forest Land north of I-84	Parking would be limited to 75 spaces adjacent to the kiosk	Parking would be limited to 75 spaces adjacent to the kiosk. A user fee would be charged for all uses of National Forest land north of I-84
<b>Recreational Uses and Development</b>					
Can regional recreation need be met while protecting site resources?	No recreational development would occur. Informal use of the site would continue and increase, increasing erosion, vandalism and sanitation problems	Alternative 2 maximizes recreational development, but directs uses away from river banks and STE resources. Support facilities for existing boat dock would solve sanitation problems, but could increase conflicts with bald eagle nest	Trails direct recreation use away from river banks and STE resources. No improvements to support existing boat dock would be built, so sanitation problems would continue	Minimal trail development avoids river banks and STE resources. Removing boat dock would eliminate conflict with bald eagles and cultural resources	Trail direct recreation use away from river banks and STE species. Boat dock moved further away from bald eagles and cultural resource sites

ISSUE	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5
Management to reduce/ avoid conflicts among users?	There would be no change from existing (minimal) site management. Conflicts among users would increase as use of the site increases	No hunting or exercising pets off leashes would be allowed. Trails are designed to separate uses. Other uses directed to specific areas to minimize conflicts. On-site staff and caretaker to manage conflicts	No equestrian use would be permitted; hunting and exercising pets off leashes would be restricted; other uses would be directed to specific areas to minimize conflicts. On-site caretaker to manage conflicts	No camping, equestrian, mountain bike use or collection of special forest products would be allowed. Other uses would be limited by limited trail system. Hunting would be allowed with weapons restrictions	No equestrian use or camping would be permitted. Other uses would be restricted to specific areas or times in order to reduce conflicts. On-site caretaker to manage conflicts
Will I-84 or Jordan Road improvements affect Lewis & Clark State Park facilities?	No change; no effect	Realignment of Jordan Road will change the entrance to the Lewis & Clark Park paved parking area and boat ramp, and improve access to the Sandy River from the park	Same as Alternative 2, but construction of the Gateway south of I-84 will also replace gravel parking area with Gateway and 75 paved parking spaces	No change to Lewis & Clark State Park, but construction of the Gateway south of I-84 will also replace gravel parking area with the kiosk and 75 paved parking spaces	Realignment of Jordan Road will change the entrance to the Lewis & Clark Park paved parking area and boat ramp, and improve access to the Sandy River from the park. Construction of the Gateway south of I-84 will replace gravel parking area with the kiosk and 75 paved parking spaces
Effects on rock climbing on Broughton Bluff and access to Gorge trails?	No change	Realignment of Jordan Road would include crosswalks for climbers and trail access. Road will be at least 50 feet from base of bluff	Same as Alternative 2	No change from existing conditions	Same as Alternative 2
<b>Public Safety</b>					
How will illegal uses be controlled?	No change. Periodic patrols by FS or Sheriff	On-site caretaker and staffed Gateway. Some uses prohibited. Sanitation facilities provided	Same as Alternative 2	Periodic patrols by FS and Sheriff. Removing boat dock and prohibiting camping will remove sources of sanitation problems	Same as Alternative 2



ISSUE	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5
Effects on emergency service agencies?	Use will increase and so will calls for service from site, but no on-site facilities would be provided	FS staff on-site to respond to emergencies quickly. Increased use increases risk of man-made problems	Same as Alternative 2	No on-site FS staff. Increased use increases risk of man-made problems	Same as Alternative 2
<b>Restoring/maintaining natural hydrologic regimes</b>					
Measures to control channel meandering, erosion, riparian habitat health?	No change. Continued informal recreation use will trample stream banks, increasing erosion	Trails would direct use away from stream banks and revegetation of shorelines will improve riparian habitat health. No interference with natural floodplain processes is proposed	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2
Should the historic dam be removed? What would be the effects on resources?	No change. The dam could be removed later if studies support it, and alternative access to BPA and NWPC lines is provided	The historic dam would be used to provide access to Sun Dial Island. The dam is permeable, so no change to hydrology of the slough	Same as Alternative 2	The dam would be retained, but used only for emergency access to Sun Dial Island. It could be removed later, if studies support removal and alternative access to BPA and NWPC lines is provided	Same as Alternative 2
What effects will water drawdowns from the Columbia River dams have on the habitat restoration of the site?	No habitat restoration proposed -- no effect	Proposed changes in Columbia system management may marginally increase water levels on-site or maintain wetland hydrology longer in the season	Same as Alternative 2. Increase in water levels would enhance probability of achieving the proposed creation of wetlands and open water on the site	Same as Alternative 2. Increased water levels would reduce the potential for conifers to become established on the site	Same as Alternative 3
Effects of Troutdale Sewage Treatment Plant on recreation use along Sandy River?	No change	The proposed fishing access to the Sandy would be for fishing only, not water contact recreation, and it would be located over half a mile from the Troutdale plant. No effect	No additional access to the Sandy is proposed. Users would be directed away from the river bank by developed trails	Same as Alternative 3	Same as Alternative 2



SANDY RIVER DELTA EIS

ISSUE	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5
Effect of Jordan Road realignment under the railroad on groundwater?	No realignment: no effect	Groundwater levels are below the level of the proposed undercrossing. However, the facility would be at approximately the 25 year flood elevation, and would be flooded by a larger flood event	Same as Alternative 2	No realignment: no effect	Same as Alternative 2
Effects on wetlands and riparian habitat?	No change: no effect	I-84 improvements would require filling wetland ditches adjacent to the north on/off ramps. Total fill would be less than 1 acre. I-84 bridge widening would require in-water work, but also affect less than 1 acre. Proposed barrier-free fishing site would be located at least partially in the Sandy River. Again, the area affected would be less than 1 acre	Same as Alternative 2, but no barrier-free fishing site would be included	Same as Alternative 3	Same as Alternative 3
<b>Landscape Restoration and Enhancement</b>					
What landscape patterns should be created?	No enhancement would be implemented; natural succession would occur	Emphasizes habitat diversity	Emphasizes open habitats, to serve migratory waterfowl and restore habitat lost through development of the Portland area	Emphasizes reforestation to restore the site to the appearance at the time of first European contact. Forested riparian habitat is very scarce in the region	Combines open Thousand Acres with reforested Sun Dial Island
How will wetlands be protected from increased access and new recreational uses?	No improvements will occur and informal use will increase. Habitat degradation likely	Trail system designed to avoid wetlands or cross on boardwalks. On-site caretaker and FS staff to police recreation use	Same as Alternative 2	Trails avoid wetlands	Same as Alternative 2

ISSUE	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5
Effects of invasive species on native plants and animals?	No change. The site would continue to be overrun with blackberries and reed canarygrass	Vegetation control measures would allow native species to re-establish, supporting a wider variety of wildlife	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2
Effects of vegetation control measures on native plants and animals, particularly STE species?	Only biological controls would be used. No effect	Proposed vegetation control measures could adversely affect native species. However, these would be replanted. Areas with STE plants would not be treated, and a buffer zone would be left around these populations where only hand weeding would occur	Same as Alt. 2. Ongoing use of herbicides likely to control reed canarygrass	Vegetation control would be achieved by hand weeding or grubbing and shading out undesirable species by planting desirable natives	Same as Alternative 3
<b>Fish and Wildlife Habitat Restoration &amp; Enhancement</b>					
Which species should the site be managed for?	No change	The diverse habitat mix and more extensive recreation development would support wildlife which can cohabit with man using the site. Revegetation of riparian areas will improve shallow water habitat for fish	The open habitat would promote use by migratory waterfowl, wading birds and herptiles. It would also provide foraging habitat for eagles and hawks	The forested riparian habitat would support use by yellow-billed cuckoo, bald eagle, northern pygmy owl, northern saw-whet owl, pileated woodpecker and Lewis' woodpecker. Revegetation of riparian areas will improve shallow water habitat for fish	Combines open and forested habitat and would benefit species found in both
What will be the effect of increased recreational use on site resources?	Alternative 1 includes no measures to manage recreational use to reduce conflicts with fish and wildlife	Extensive trail system will leave no areas of the site inaccessible to recreational users. Improved facilities for the existing boat dock could increase conflicts with the existing bald eagle nest	Reduced trail system will leave areas of the site free from human use	Reduced trail system will leave areas of the site free from human use. Eliminating the boat dock will remove the source of conflicts	Reduced trail system will leave areas of the site free from human use. Moving the boat dock will reduce conflicts between this recreational use and the bald eagle nest
Will any STE species be affected?	No	May effect existing bald eagles and Columbia cress populations	No effect	No effect	No effect

SANDY RIVER DELTA EIS

ISSUE	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5
What effects will increased human activity have on nearby habitats?	This alternative would not manage recreational use, so erosion from informal trails would continue to effect the Sandy and Columbia Rivers	River access would be directed to specific areas and other banks would be revegetated, improving fish habitat. Remaining areas are separated from the site by the rivers and I-84	Same as Alternative 2	New river access points would not be created, and the site would be reforested. This alternative would have maximum benefit to adjacent aquatic habitat	Same as Alternative 2
How will potential conflicts between waterfowl and Troutdale Airport be resolved?	No change	Proposed open habitat areas would be located outside the area of typical airport operations. Planes would be high enough over these areas to avoid scaring waterfowl	Same as Alternative 2	Reforestation of the site will reduce waterfowl use and therefore conflicts	Same as Alternative 2
<b>Visual Resources</b>					
What are the effects on views for Troutdale residents on the west side of the Sandy River?	No change: no effect	The Gateway would be located in the interior of National Forest land, which is not visible from the Sandy River. Recreational development north of I-84 focuses on the interior of the site, except at key river access points which are located across from industrial not residential neighborhoods	The Gateway would be located between I-84 and the UPRR line, an area that is not visible from Troutdale because of riparian vegetation. Landscaping around the gateway would increase this buffer. Recreational development north of I-84 focuses on the interior of the site, except at key river access points which are located across from industrial not residential neighborhoods	Same as Alternative 3	Same as Alternative 3
What are the effects on views for travelers entering the Gorge?	As the site gradually reforests the view will change from open meadow to riparian forest	Landscape enhancement will maintain open habitat adjacent to I-84, but control invasive vegetation. The Gateway would not be visible from I-84	The Gateway may be visible from the I-84 Sandy River bridge, which could encourage use. Open habitat would be enhanced north of I-84. Landscaping the area between I-84 and the UPRR would improve views	Proposed reforestation of the site will alter the view as visitors enter the Gorge. The gateway kiosk may be visible from I-84, but will be landscaped. Landscaping the area between I-84 and the UPRR would improve views	Same as Alternative 3

ISSUE	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5
<b>Archaeological and Cultural Resources</b>					
What measures will be needed to protect cultural resources from increased site use?	Stabilization and protection of resources would occur, as required by law. Further protection would not be implemented	Stabilization and protection of the historic dam and site 35MU76 would occur. If proposed support facilities for the existing boat dock increase use of the area, additional protection may be needed for site 35MU76	Stabilization and protection of the historic dam and site 35MU76 would occur	No recreational use is proposed on or near identified resources. Boat dock would be removed, reducing existing conflicts	Same as Alternative 3 and existing boat moorage will be moved 0.6 miles north away from resources
Will the project affect the NRHP eligible dam on the old Sandy channel?	No change	Use of the historic dam to access Sun Dial Island may require some modification to the dam surface. Any modification would be approved by SHPO	Same as Alternative 2	No recreational use is proposed on or near identified resources	Same as Alternative 2
<b>Relationship to Other Land Uses</b>					
Effects on Lewis & Clark State Park?	No change	Increased recreation and river access north of I-84 could accommodate some of the regional demand currently handled by Lewis and Clark State Park. Realignment of Jordan Road would use 0.7 acre of parkland, but replace it with 0.6 acres currently occupied by the road	The existing gravel parking area would be removed and replaced with the Gateway and 75 paved parking spaces. Realignment of Jordan Road would use 0.7 acre of parkland, but replace it with 0.6 acres currently occupied by the road	The existing gravel parking area would be removed and replaced with the kiosk and 75 paved parking spaces	Same as Alternative 3
Effects on the City of Troutdale?	No change	Development of the Gateway on National Forest land would preclude inclusion of the gateway in the proposed Troutdale Chamber of Commerce development. If water and sewer cannot be provided on-site, the FS may request extension of service from the City	Same as Alternative 2	Use of a kiosk for the gateway would be consistent with a staffed facility in the proposed Troutdale Chamber of Commerce development	Same as Alternative 4



ISSUE	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5
Effects on Troutdale Airport?	No change	Increased recreational use on the site may increase complaints about airport-related noise. Proposed open habitat would encourage waterfowl use. Flocks of birds can pose a hazard to small planes when startled. The open area is outside the area of typical airport operations	Same as Alternative 2	Reforestation would reduce potential conflicts between waterfowl and airplanes	Same as Alternative 2
Effects of proposed interchange improvements on Section 4(f) and 6(f) resources be minimized?	No change, no effect	Existing Jordan Road right-of-way would be traded for realigned right-of-way. OPRD land between I-84 and UPRR would be exchanged for ODOT or FS land of equal value and use	Same as Alternative 2	No effect on the park itself. OPRD land between I-84 and UPRR would be exchanged for ODOT or FS land of equal value and use	Same as Alternative 2
Effects of interchange improvements on Wild & Scenic designation of Sandy River?	No change	Widening the interstate bridges would not effect the eligibility of this segment of the Sandy for W&S designation	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2
<b>Air Quality/Noise</b>					
Effects of increased traffic on air quality and noise levels?	Traffic will increase due to regional growth, and affect noise and air quality at the site	Traffic will increase due to regional growth, and affect noise and air quality at the site. Some of this traffic will be diverted to the site, but effects will be minimal	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2
Effects of freeway, airport, and recreational noise on wildlife?	No change	Species and users requiring quiet do not and will not use the site. Minimal noise increase from project activities.	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2



## **3.0 AFFECTED ENVIRONMENT**

### **3.1 INTRODUCTION**

This chapter describes the existing conditions of the environment that could be affected by each of the alternatives being considered. The location of the study area is described in Section 1.1.1 along with relevant ownership and management interests. The information in this chapter will provide a basis for evaluating the potential effects of the alternatives under consideration (Chapter 4.0).

### **3.2 SOILS AND GEOLOGY**

Soils and geology resources within the study area were identified through review of available reference materials, soil mapping, aerial photography dating back to the 1930s, and on-site investigations. The investigations included evaluating surface conditions, soil types, soil characteristics, and geologic features throughout the study area. The technical report that serves as a basis for this section is included in the project analysis file. Groundwater is addressed in Section 3.3.

#### **3.2.1 Topography**

The Delta subarea is a predominantly flat river delta which in historic times was subject to annual inundation. There is evidence of this flooding in the remnant channels and islands which give the site its rough, hilly terrain within the overall flat profile. The other subareas are characterized by flat to gently sloping topography.

#### **3.2.2 Soils**

Soil textures examined and described throughout the study area range from fine grain silts to coarse gravel characteristic of Columbia River floodplains. These soil textures and characteristics have been mapped and described by the Soil Conservation Service (SCS) in their Soil Inventory of Multnomah County, Oregon. Field examinations confirmed the soil descriptions and distribution patterns described by the SCS. Individual surface soils are described below and shown on Figure 3.2-1. A small terraced area identified near the center of the Delta appears to consist of artificial fill materials placed on the east side of the levee road. Uncontrolled fills may also exist in areas excavated for construction of I-84. Very wet soils were encountered in field investigations below a depth of five feet. Previous work by others (Buren, 1993) indicated that groundwater in the upper soil is unconfined, perched, and discontinuous.

Soil units mapped throughout the study area are representative of landform and topographic features observed. Field examination indicates that actual boundaries of soil units adjacent to major landforms, topographic breaks, and major slope changes are within 50 feet of the current SCS mapping. The following soils were found on the site:

**Dabney Loamy Sand**, an excessively drained soil formed in sandy alluvium. This soil has few limitations for development, but is not recommended for septic tank absorption fields.

**Faloma Silt Loam**, a poorly drained soil that is on the list of hydric (wetland) soils of Oregon. The poorly draining characteristic of this soil limits the utilization for on-site sewage treatment and disposal systems.

**Faloma Silt Loam, Protected**, a poorly drained soil with severe limitations for development of urban uses due to seasonal high water table. Drainage must be installed for urban development.

**Haplumbrepts**, well drained and moderately well-drained soils which are subject to slumping, and are severely limited for homesite construction and other urban uses.

**Pilchuck Sand**, an excessively drained soil located along the Columbia River.

**Rafton Silt Loam, Protected**, a very poorly drained soil that is also listed as a hydric (wetlands) soil. However, these soil characteristics also mean that this area is a good candidate for wetlands enhancement.

**Riverwash**, a soil occurring extensively along the south shoreline of the Columbia River and in the Sandy River drainage and includes sand and gravel deposits. Riverwash soil is subject to overflow when the water is high and is extremely droughty when the water is low. New surface material is added and removed with each overflow occurrence.

**Sauvie Silt Loam**, a poorly drained soil that is also listed as a hydric soil and is associated with wetlands.

### 3.2.3 Geology

#### *Geologic Formation and Rock Units*

The study area is located in the eastern portion of the Portland Geologic Basin, bounded by the Cascade Range to the east and the Tualatin Mountains to the west. The geology and rock exposures examined and mapped throughout the study area are the result of several successive events. The exposed geology spans a total of five geologic epochs and approximately 35 million years.



SOURCE: COMPILED FROM SOIL CONSERVATION SERVICE SOIL SURVEY OF MULTNOMAH COUNTY, OREGON (AUGUST 1983 FROM 1975 AERIAL PHOTOGRAPH).

## LEGEND

- SANDY RIVER DELTA STUDY BOUNDARY
- STATE BOUNDARY
- UNION PACIFIC RAILROAD
- BPA TRANSMISSION LINES
- GAS PIPELINE
- [Pattern] DABNEY LOAMY SAND (B)
- [Pattern] FALOMA SILT LOAM (E)
- [Pattern] FALOMA SILT LOAM, PROTECTED (16)
- [Pattern] HAPLUMBREPTS, VERY STEEP (20F)
- [Pattern] PILCHUCK SAND (3)
- [Pattern] RAFTON SILT LOAM, PROTECTED (40)
- [Pattern] RIVERWASH (41)
- [Pattern] SAVVIE SILT LOAM (44)

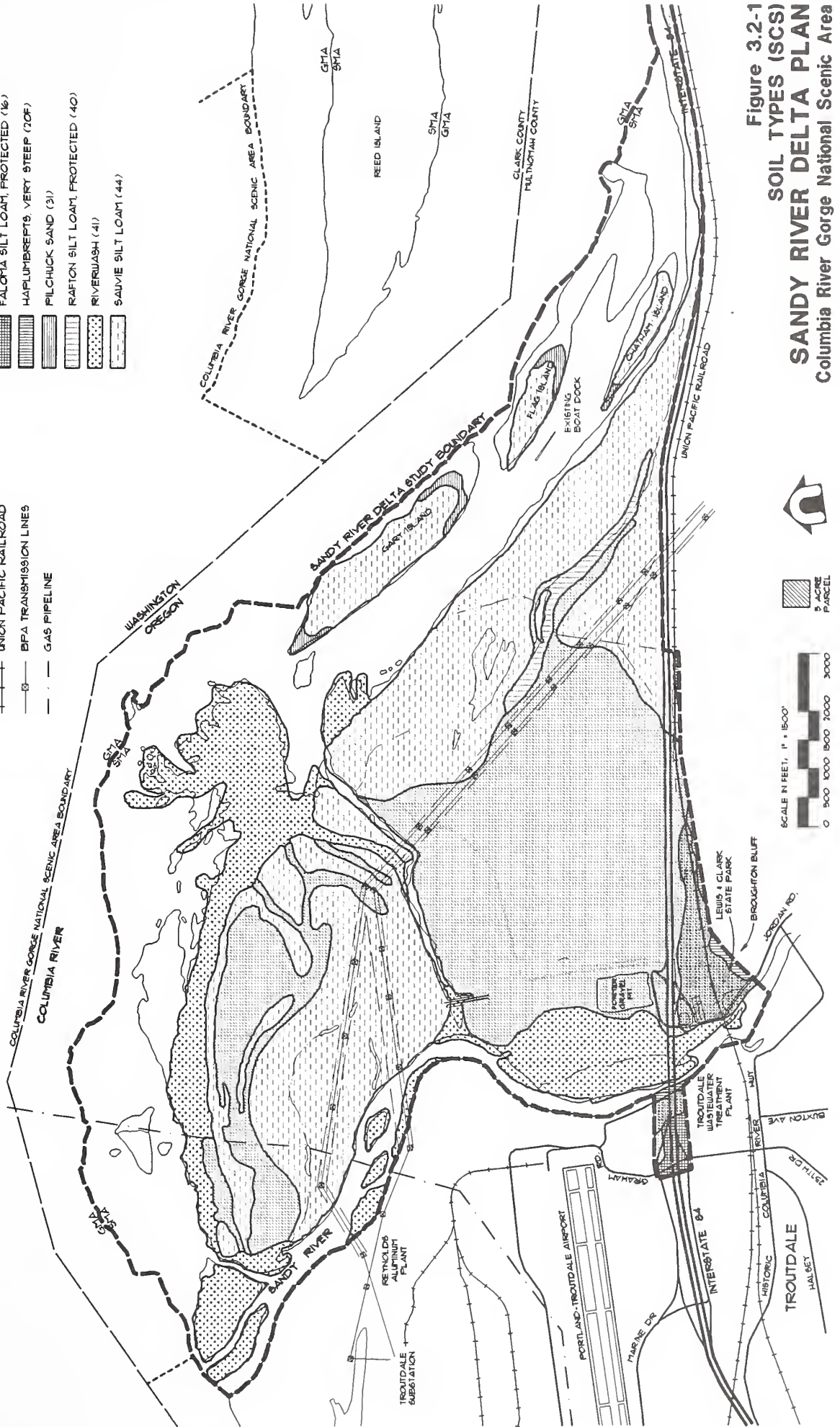


Figure 3.2-1  
SOIL TYPES (SCS)  
**SANDY RIVER DELTA PLAN**  
Columbia River Gorge National Scenic Area





### ***Geomorphology***

A review of aerial photography dating back to 1935 indicates that a series of primary channels for the Sandy River has occurred within the Delta subarea. The primary channel passed through the Delta to the north and east into the Columbia River until 1932 when a diversion dam was placed across the primary channel and the river was diverted to the north through a secondary channel. Aerial photography from 1935 reveals that the primary channel had been migrating to the north with an abandoned channel occurring just to the south of the active channel at that time. Indications of several small accreted islands appear along the north shoreline and possibly along the eastern shoreline to the Columbia River. The Columbia River appears to have deposited several natural levees and additional land on the east side of the Delta.

In 1955 and 1963 photographs, the dam established across the primary channel was inundated, allowing water to flow freely through both channels northward. The 1963 photographs also show indications of a large quarry or excavation on the west side of the Delta north of I-84 used as a materials source for the expansion of the freeway. The Delta has grown through the silting in of the former main channel. There are few other indications of excessive erosion or growth throughout the 38 years of aerial photography. Small channels and sloughs in the northeast portion of the Delta appear to have filled in over the years. The surface conditions show the most dramatic changes to be the removal of the trees and conversion to agricultural land and then the re-establishment or regrowth of trees over the site.

### ***Geologic Hazards***

Structural geologic changes began within the Portland basin approximately 35 million years ago. The basin formed as a result of regional uplifting to the east and west during early Miocene age. Seismic activity continues today along the Cascade uplift just to the east of the study area.

Geologic structures such as faults, fractures, or lineaments are difficult to find and examine due to the surface cover of Boring Lava and the extensive erosion and deposition that has taken place. A normal fault has been identified and mapped directly north of the Sandy River Delta on the north side of the Columbia River. A review of the existing literature found that the pattern of fractures and faulting through the area is primarily to the northeast-southwest of the study area, with associated fractures and/or faults perpendicular to the primary faulting. No test drilling was conducted to verify subsurface geology.

The study area is located in earthquake zone 2B, according to the Uniform Building Code. Several lines of evidence now suggest that the Portland metropolitan area may be subject to earthquakes larger than any recorded in the short history of European settlement in the region. The exact location, magnitude, and frequency is still subject to substantial debate. Without reliable event data, it is difficult to predict the degree of earthquake damage. However, the



study area's saturated soils could be subject to liquefaction in the event of a moderate to strong earthquake on one of the faults in the area.

### **3.2.4 Mineral and Energy Resources**

There are no known coal, oil, or gas deposits on the project site and exploration for these resources is not consistent with the NSA plan. Gravel has been extracted, in the past, from the area immediately north of the current Jordan Road interchange and from the Sandy River north of I-84. This source was probably deposited by glacial run-off during the ice age. Commercial grade aggregate deposits also exist on Sun Dial Island at the current mouth of the Sandy River.

## **3.3 HYDROLOGY**

Surface and groundwater hydrology within the study area were identified through review of available reference material, aerial photography, and on-site investigations. The technical report that serves as a basis for this section is included in the project analysis file.

### **3.3.1 Climate**

The Sandy River Delta study area climate experiences both the marine-influenced weather of the western valleys and the continental weather of the Columbia Basin. Weather conditions are less moderate than those experienced in Portland.

Orographic lift (areas where mountains hinder the passage of storms), in this case from the northern flanks of Mt. Hood, results in mean annual precipitation of about 62 inches at the site, while Portland, just 13 miles to the west, receives approximately 38 inches annually. Just a few miles to the south in the Sandy River drainage, mean annual precipitation exceeds 72 inches. Almost 90 percent of the annual precipitation falls between October and May (Gale Research, 1981).

Frequent outbreaks of high pressure from east of the Cascades during the winter months result in rapid evaporation from dry easterly winds. Summer winds tend to be directed up the river between May and October. East winds predominate between November and mid-March, and are generally the strongest. Mid-March to May is a transitional period with variable winds. Wind speeds of up to 80 miles per hour (mph) have been recorded at Bonneville Dam east of the site. Winds of 10 to 30 mph are more typical.

The SCS describes rainfall distributions for storm events based on 2-year, 24-hour and 100-year, 24-hour recurrence intervals. The study area is within the geographic boundary for rainfall distributions classified by SCS as type IA (synthetic rainfall distribution), typical for western Oregon and western Washington. Predicted rainfalls are:

2-year, 24-hour	3.0 inches
5-year, 24-hour	3.5 inches
10-year, 24-hour	4.0 inches
25-year, 24-hour	4.5 inches
50-year, 24-hour	5.0 inches
100-year, 24-hour	5.5 inches

### 3.3.2 Geomorphology

The geology of the study area is described in Section 3.2. The study area is on the very northeastern corner of the structural basin formed between the foothills of the Cascades and the Tualatin Hills. Erosion and deposition by glacial meltwaters, and large storm events of the Columbia River and to a lesser extent the Sandy River, have created the terraces, old bars, and abandoned channels found on the site. This serpentine network of hillocks and swales affects runoff patterns, although all the water eventually drains to the Columbia River.

### 3.3.3 Surface Water Hydrology

#### *Regulations/Policies*

Regulations applicable to water resources within the study area include the Federal Clean Water Act, two federal executive orders and NSA Management Plan requirements that pertain to riparian and wetland areas protection and enhancement. The executive orders are found in Forest Service Manual (FSM) Section 2527.01: 11988 - Protection of Flood Plains, and 11990 - Protection of Wetlands. Special aquatic sites, including wetlands, are regulated as Waters of the United States by ACOE in accordance with Section 404 of the Federal Clean Water Act of 1977. Section 404 provides the ACOE authority to regulate certain activities involving the discharge of dredged or fill materials into special aquatic sites, including wetlands and other Waters of the United States (i.e. streams, rivers, lakes and ponds). Recently enacted (September, 1993) regulations modify the ACOE definition of "discharge of dredged material" to include excavation activities. Any addition of dredged materials into waters of the U.S., including incidental discharges associated with mechanized land clearing, ditching, channelization, or other excavation would trigger Section 404 requirements. Executive Order 11990 (May 24, 1977) requires all federal agencies to minimize destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands (Forest Service Manual (FSM) 2500).

Under the NSA Management Plan, SMA guidelines for surface water features, wetlands, and riparian areas are:

5. *Wetlands shall not be destroyed except within roads and railroad right-of-way as provided in guideline 6. Riparian areas shall not be*

*destroyed, except for water-dependent uses, such as boat ramps, and road construction and reconstruction. The above-stated exceptions to riparian destruction policy shall meet minimum natural resource protection standards and be reviewed for meeting resource protection guidelines.*

Additionally, SMA guidelines have provisions for dealing with water resources:

6. *Minimum natural resource protection standards include:*

B. *Riparian areas, wetlands, ponds, and lakes.*

- (1) Adding any fill or draining of wetland is prohibited.*
- (2) A minimum 200-foot buffer zone shall be created on the landward side of each wetland, pond or lake; or a wider variance from this requirement shall be determined during the site plan analysis of the wetland or riparian area and those species inhabiting the area, as determined by the Forest Service biologist in consultation with state and/or federal agencies.*
- (3) A 200-foot buffer zone shall be created along each fish-bearing and perennial stream.*
- (4) A 50-foot buffer zone shall be created along intermittent streams.*
- (6) Maintenance, repair, reconstruction and realignment of roads and railroads within their rights-of-way shall be exempted from the wetlands and riparian guidelines upon demonstration of all of the following:*
  - (a) The wetland within the right-of-way is a drainage ditch not part of a larger wetland outside of the right-of-way.*
  - (b) The wetland is not critical habitat.*
  - (c) Proposed activities within the right-of-way would not adversely affect a wetland adjacent to the right-of-way.*

F. *Air and water quality*

- (1) Streambank and shoreline stability shall be maintained or restored with natural revegetation.*
- (2) All new developments shall be carried out to comply with state water quality requirements.*





DAVID EVANS AND ASSOCIATES, INC.

#### NOTE 6

COLUMBIA RIVER FLOOD PLAN INFORMATION U.S. ARMY ENGINEER DISTRICT, APRIL 1915, (BASED ON 31 JULY 1915 PHOTOGRAPH)  
SANDY RIVER FLOOD PLAN INFORMATION U.S. SOIL CONSERVATION SERVICE "FLOOD HAZARD ANALYSIS LOWER SANDY RIVER AND BEAVER CREEK" OCTOBER 1971  
TOPOGRAPHY, U.S.G.S. 8E/4 CATHAS 15' QUAD 1961, PHOTO REVISED 1970 & 1975  
FLOODPLAIN CHECKED AGAINST U.S.D.A. FOREST SERVICE DIGITAL PHOTOGRAPHIC MAPPING DATED 7-11-54

#### LEGEND

- SANDY RIVER DELTA STUDY BOUNDARY
- STATE BOUNDARY
- UNION PACIFIC RAILROAD
- BPA TRANSMISSION LINES
- GAS PIPELINE
- SANDBAR AREA (USGS)
- OPEN WATER (USGS)
- FLOODWAY BOUNDARY
- 100 YEAR FLOOD BOUNDARY
- 500 YEAR FLOOD BOUNDARY
- LIMITS OF FLOODPLAIN STUDY
- FLOODWAY FRINGE
- 0 M 123 RIVER MILE

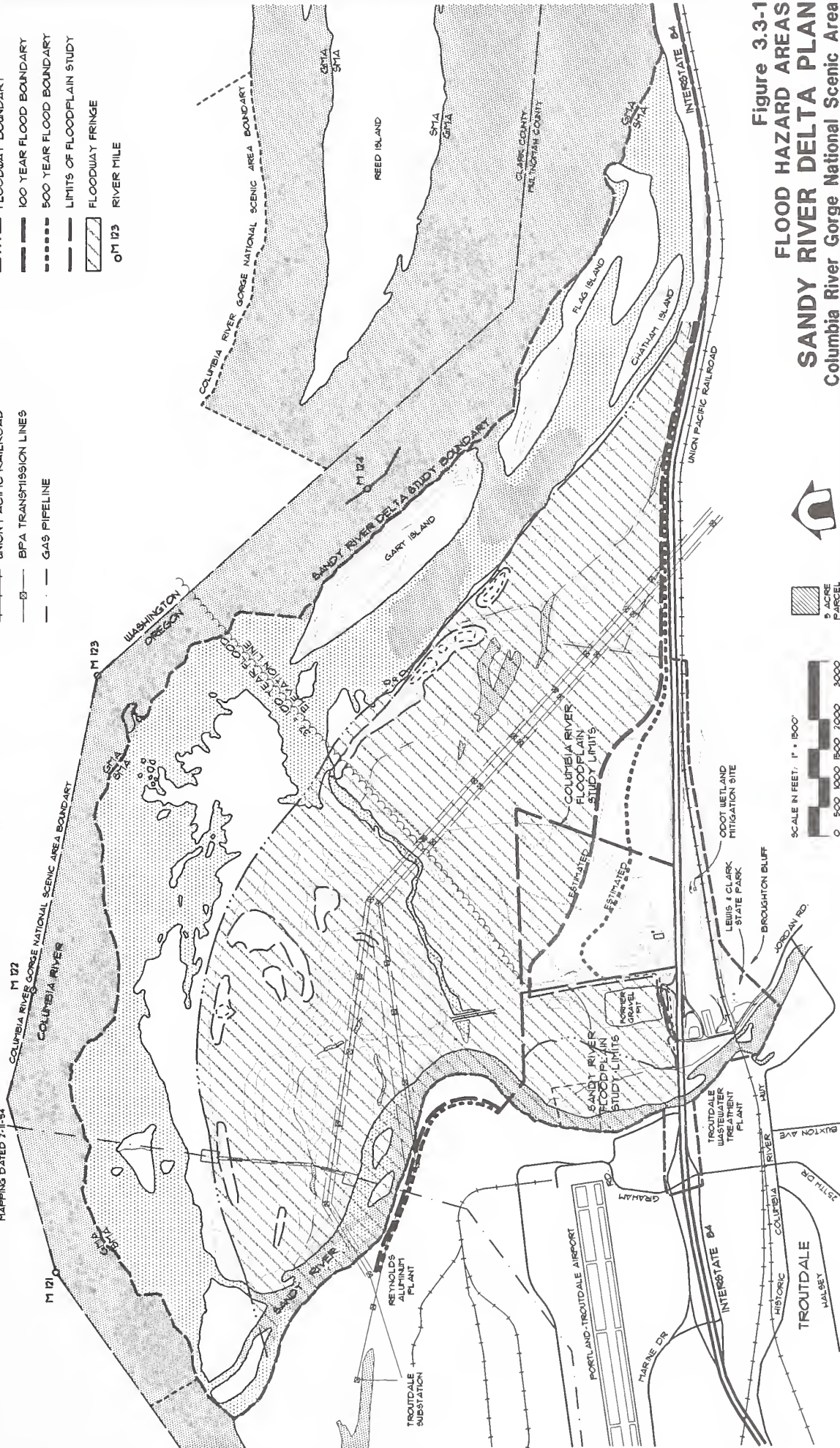


Figure 3.3-1  
FLOOD HAZARD AREAS  
SANDY RIVER DELTA PLAN  
Columbia River Gorge National Scenic Area





### *Floodplains*

The study area is predominantly within the 100-year floodplain of the Columbia River. This floodplain, depicted in Figure 3.3-1, shows a 32-foot contour for this surface at the middle of the site. The floodplain or flood hazard area is partitioned into the floodway and the flood fringe. The floodway is the theoretical area which could convey the 100-year storm discharge with only a one-foot rise in the water level above the unconstrained flood event.

Columbia River water levels are recorded by the USGS at Washougal, Washington (RM 122.9 from the mouth of the Columbia River). The drainage area at this location is approximately 240,000 square miles. Extreme instantaneous recorded water levels for this period range from high water of 28.9 feet on June 19, 1972, to a low of 3.7 feet on July 10, 1977. The extremes for water year 1993 include high water of 20.52 feet on May 18, and a low of 3.74 feet on September 26. Table 3.3-1 describes recorded gauge heights for this station.

The Columbia River at the study area is tidally influenced. ACOE flood profiles record several floods influenced by simultaneous high tides. Winter floods have resulted from a combination of backwater from high tides and discharge from heavy rains. Despite regulation by Bonneville Dam since 1949, the December 1964 flood (which has been defined as a storm event of approximately 100-year recurrence interval), covered the site north of I-84.

Sandy River streamflow is partially regulated. Flow is diverted for power generation at Lake Roslyn, then is returned via the lower Bull Run River. The Bull Run River, a major tributary of the Sandy, has been regulated since completion of Bull Run Reservoir Number One in 1928. Two reservoirs currently divert a portion of upper Bull Run River streamflows out of the watershed for Portland's water supply.

The Multnomah County Flood Insurance Study provides the following data for the Sandy River at the I-84 bridge (Bryson, pers. comm. 1992):

10-year event	elev. 26.5 feet	46,500 cfs*
25-year event	elev. 28.0 feet	56,000 cfs
50-year event	elev. 30.0 feet	72,000 cfs
100-year event	elev. 32.0 feet	82,800 cfs
500-year event	elev. 35.0 feet	127,400 cfs

\* cfs = cubic feet per second

USGS stream gauging records show a peak flow of 84,400 cfs at the Sandy River below Bull Run River on December 22, 1964. The drainage area of the Sandy River at that gauge is 436 square miles, whereas its drainage area at I-84 is 502 square miles (Bryson, pers. comm., 1992). This suggests that the peak flow was probably closer to 95,000 cfs, based on an extrapolation of unit runoff (84,400 cfs/436 square miles = 190 cfs/square mile). Published records for the 1992 water year show a low mean daily discharge of 158 cfs and a high mean

daily discharge of 25,400 cfs (Hubbard, et al., 1992). Table 3.3-2 illustrates how the dynamic nature of this river persists despite regulation of tributaries such as the Bull Run by dams. Approximately 90 percent of the runoff occurs between November and June.

### ***Runoff Characteristics***

Most surface runoff from the site drains toward the Columbia River. Field observation indicates that an intricate structure of natural swales and mounds exists throughout the study area, particularly in the Delta portion, which captures and directs surface runoff in a serpentine manner. No indications of potential development constraints due to patterns of surface runoff were observed.

A series of corrugated metal pipes pass surface water runoff from the Broughton Bluff area under the railroad and under I-84 (Mellor, 1993).

### ***Human Modifications***

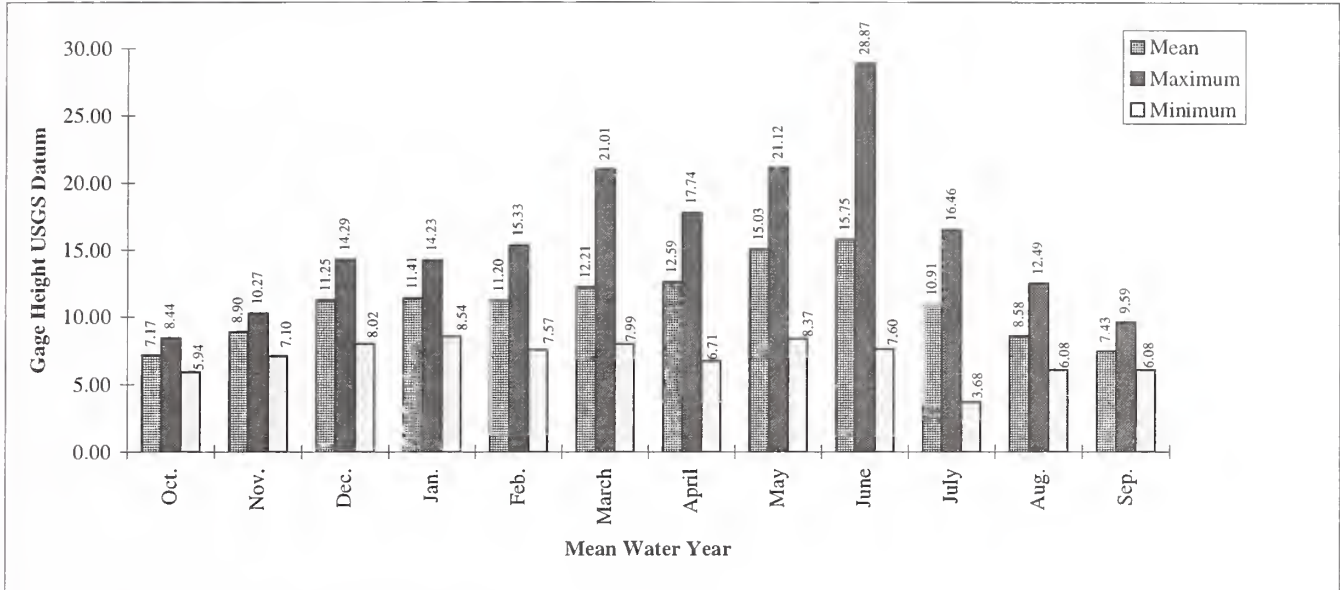
There have been numerous human impacts to the study area's hydrology. Most influential has undoubtedly been the damming of the Columbia River which limits the Spring freshet. The Spring freshet is the rapid, short-duration increase in stream flow due to snowmelt runoff. A levee constructed along the east shore of the Sandy River has also limited historical interaction between the Sandy River and its floodplain. A rock dam built in the 1930s to rechannel the mouth of the Sandy River to improve a smelt fishery partially isolates a slough from the Sandy River. Field observation indicates that this is a rather permeable dam when viewed in terms of the foundation material on which it rests. Surface water moves across this barrier in varying directions depending on the stages of the Columbia and Sandy rivers.

The levee on the east shore of the Sandy River was built in the 1940s and the Sandy River was dredged in the reach which has the I-84 bridge (Mellor, 1993). The UPRR, I-84, and Jordan Road have impacted surface water and groundwater in the southwest corner of the study area through creation of embankments and by excavation of borrow material. Other impacts to surface water hydrology have resulted from a number of drainage ditches developed for agricultural and other purposes. Mellor (1993) also reports wetland fill from ACOE dredge activities. ODOT constructed a forested wetland mitigation area in the southwest corner of the site as mitigation for I-84 expansion.

### **3.3.4 Groundwater Hydrology**

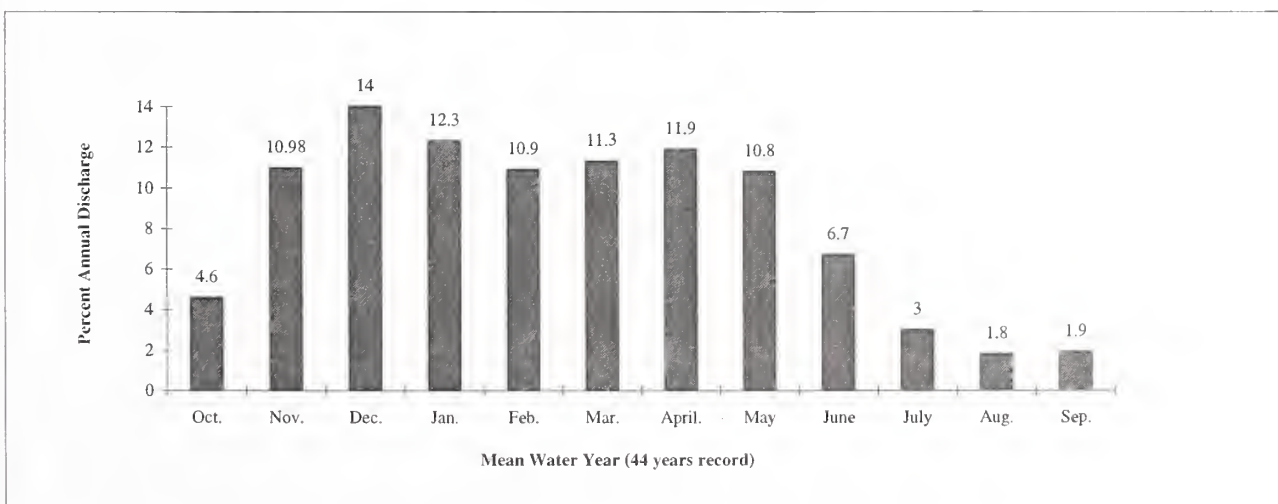
Although a number of groundwater studies have been conducted within the east Multnomah County area, there is limited data specific to the study area. The most significant groundwater is found in two water bearing units: a shallow unconfined aquifer of sands and gravels and the porous sandstone/conglomerate of the Troutdale Formation. The Columbia River Sand Aquifer is present but is likely to be at great depth, 100 to 200 feet below ground.

**TABLE 3.3-1**  
**COLUMBIA RIVER AT WASHOUGAL, WASHINGTON**  
**MEAN MONTHLY GAGE HEIGHTS AND EXTREMES**  
 Drainage Area 240,000 square miles



Source: USGS Water-Data Reports OR-91-1, OR-92-1  
 Earth Info Western States USGS-WRD Data, 1990.

**TABLE 3.3-2**  
**SANDY RIVER BELOW BULL RUN RIVER**  
**NEAR BULL RUN, OREGON**  
 Drainage Area 436 square miles



84,000 cfs = maximum discharge, December 22, 1964  
 45 cfs = minimum discharge, September 26, 1962  
 Source: USGS Open-File Report 90-118



Mapping by Hogenson and Foxworthy (1965) identifies several springs where the Kelso slope bluff meets the Columbia River floodplain north-northwest of Troutdale. Similar springs are present east of the Sandy River. The water on the south side of the Thousand Acres comes from such a spring on Broughton Bluff and is piped under the highway. Groundwater in the Troutdale Formation discharges directly to the Columbia River, and also likely discharges to the alluvial terraces of the floodplain.

Records of selected wells at Lewis and Clark State Park and the Reynolds Metals Company property (McCarthy and Anderson, 1993) were used to construct an approximation of the average groundwater table which varies from about 22 feet to about 15 feet from south to north across the study area. A representative section based on available information is given in Figure 3.3-2. It is likely that a dynamic groundwater/surface water interface is present within the highly permeable alluvial material (McFarland pers. comm., 1992).

The groundwater table appears to vary with the stage of the Columbia River, and thus the average groundwater table follows a similar gradient from east to west across the site. In other words, the groundwater table is crudely approximated as a plane which tips from about 22 feet from the Sandy River Bridge and Corbett Station to the mouth of the Sandy River. This approximation seems to correspond logically with the location of wetlands on the site.

The area's groundwater hydrology has been impacted by human actions. Reduction of the Spring freshet on the Columbia River by Bonneville Dam has certainly reduced the inundation depth and duration for a number of wetland areas. Grading and drainage work associated with construction of I-84, the UPRR, and agriculture have also impacted saturation of areas within the study area. For example, the system of drainage ditches that crosses the transmission tower alignment just north of I-84 has lowered groundwater levels in adjacent meadows. A perched groundwater table at or near the ground surface is reported in the southwest corner of the Delta (Mellor, 1993). The water level for this perched groundwater table is estimated to vary seasonally.

A water sample taken from a spigot fed by the spring on Broughton Bluff indicates that the groundwater quality in the vicinity of the springs is potable. Further sampling was not conducted as part of this study. However, given underlying materials and the historical land uses, it is reasonable to assume that groundwater from other sites within the study area are also potable.

### **3.3.5 Wetlands**

The study area contains many wetlands as described in the Natural Resource Inventory prepared by Salix Associates and with less detail in the National Wetland Inventory (NWI) prepared by the USFWS. A total of approximately 270 acres of wetlands have been identified within the study area. Two of five wetland systems recognized by USFWS occur on-site: Riverine and Palustrine. Riverine wetlands along the Columbia River are in the Tidal



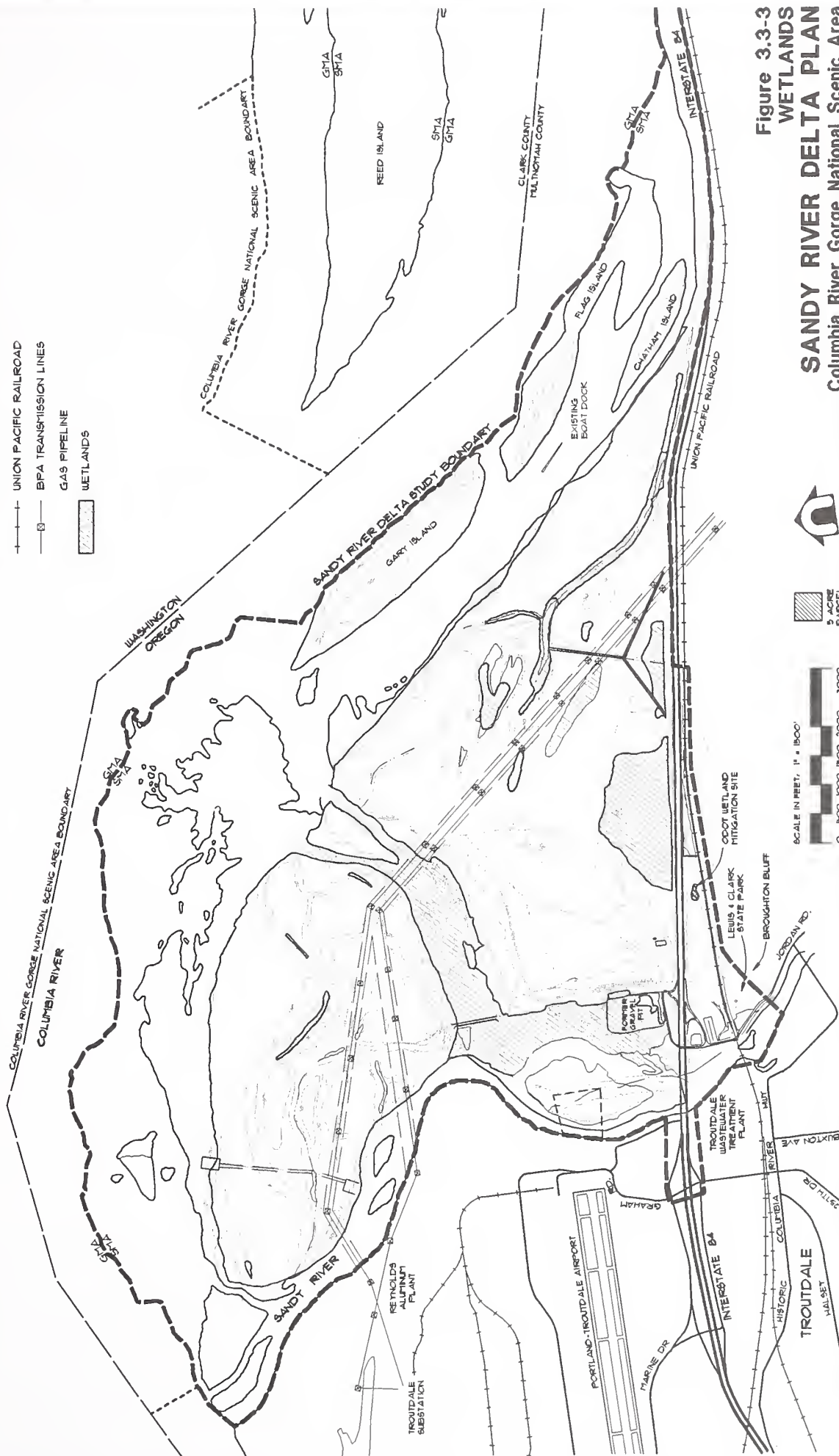
**Figure 3.3-2**  
**REPRESENTATIVE SECTION**  
**AT SANDY RIVER DELTA**  
**SANDY RIVER DELTA PLAN**  
Columbia River Gorge National Scenic Area



WETLAND DATA FROM SALIX AND ASSOCIATES  
"SANDY RIVER DELTA NATURAL RESOURCE  
INVENTORY," 1992

# LEGEND

- SANDY RIVER DELTA STUDY BOUNDARY
- STATE BOUNDARY
- UNION PACIFIC RAILROAD
- BPA TRANSMISSION LINES
- GAS PIPELINE
- WETLANDS



**Figure 3.3-3**  
**WETLANDS**  
**SANDY RIVER DELTA PLAN**  
Columbia River Gorge National Scenic Area





subsystem and include emergent, unconsolidated, and aquatic bed classes. Riverine wetlands along the Sandy River are in the Upper Perennial subsystem and consist of the rocky shore class. Palustrine wetlands include forested, scrub-shrub, emergent, and unconsolidated bottom. Wetlands and open water are shown on Figure 3.3-3. Approximate acreages of existing wetlands by classification are shown in Table 2.3-1, under the No Action alternative.

A 2.5-acre wetland mitigation site was developed by ODOT near the east end of the ODOT Triangle subarea to offset impacts from road construction in the area. It is an open water and emergent wetland.

Since the spring freshet on the Columbia River is now controlled by upstream dams, inundation is no longer experienced as frequently nor as long in sloughs and other lower portions of the study area. In contrast, General Land Office survey notes from 1854 describe inundation of the area's lowlands between early May and as late as the middle of July (Salix Associates, 1992).

Wetlands are present within the study area due to surface water saturation in sloughs and along river banks, and due to groundwater discharge in wet meadows, through seeps, and into sloughs. Regulation of the Columbia and Sandy Rivers; human disturbance from construction of I-84 and the Union Pacific Railroad; and on-site drainage for agricultural purposes have no doubt contributed to a lesser extent to the seasonal persistence of wetlands in the area. Future opportunities for wetlands enhancement will be affected not only by the high groundwater table and the presence of seeps and springs which feed the site, but also by water level regulation of the Columbia and Sandy Rivers. The latter may change, due to the need to protect threatened and endangered salmon runs. Any development involving ground disturbance in existing wetland areas will require permitting and appropriate mitigation under Section 404 of the Clean Water Act with ACOE, and the Removal-Fill Permit Program, O.R.S. 196, 800-196, 990 with DSL, as well as complying with the NSA Management Plan.

### **3.4 NATURAL RESOURCES**

According to the Metropolitan Greenspaces Inventory (METRO, 1990), the Sandy River Delta study area is one of the largest and most significant undeveloped areas in the Portland Metropolitan Area. Undeveloped Columbia River bottomland is rare today as urban development continues to expand eastward from Portland. The site contains a diversity of wildlife habitats. Although heavily disturbed, the study area still contains some outstanding natural attributes and has excellent potential for restoration and enhancement of areas that have been degraded by clearing, grazing, and hydrologic alteration.

Historically, the study area was forested, but over the years the area has been cleared. Today, approximately 25 percent of the area remains forested with deciduous tree species; the remainder is mostly meadow. The rolling character of the meadows is the result of filled-in stream channels and ditches installed to drain the site for agricultural purposes. The scouring

action caused by flooding have also contributed to the rolling character. The Delta subarea was used for agriculture (cattle grazing) for several decades up to 1991. Remnants of this grazing include the presence of invasive vegetation, compacted soil, and fencing.

The area south of I-84 has been heavily impacted by human activities, including roads, railroads and off-road vehicles (ORV). The ORV use was discontinued several years ago and some restoration initiated, including the construction of ODOT's wetland mitigation pond.

Under the NSA Management Plan, minimum SMA standards for natural resources protection (plants, wildlife, fish, and STE species) are:

*A. Sites of sensitive wildlife and sensitive plant species.*

- (1) A buffer zone shall be created around sensitive wildlife and sensitive plant species.*
  - (a) A 200-foot buffer zone for sensitive plant species.*
  - (b) A buffer zone for sites of sensitive wildlife species, such as nesting, roosting, and perching sites, as defined by species requirements and determined by a Forest Service biologist in consultation with other state or federal agency biologists.*

*B. Riparian areas, wetlands, ponds, and lakes.*

- (1) Adding any fill or draining of wetlands is prohibited.*
- (2) A minimum 200-foot buffer zone shall be created on the landward side of each wetland, pond, or lake; or a wider variance from this requirement shall be determined during the site plan analysis of the wetland or riparian area and those species inhabiting the area, as determined by the Forest Service biologist in consultation with state and/or federal agencies.*
- (3) A 200-foot buffer zone shall be created along each fish-bearing and perennial stream.*
- (4) A 50-foot buffer zone shall be created along intermittent streams.*
- (5) Revegetation shall use only species native to the Columbia River Gorge, and shall provide and maintain habitat diversity beneficial to the fish, wildlife, and native plants.*

- (6) *Maintenance, repair, reconstruction and realignment of roads and railroads within their rights-of-way shall be exempted from the wetlands and riparian guidelines upon demonstration of the following:*
  - (a) *The wetland within the right-of-way is a drainage ditch not part of a larger wetland outside of the right-of-way.*
  - (b) *The wetland is not critical habitat.*
  - (c) *Proposed activities within the right-of-way would not adversely affect a wetland adjacent to the right-of-way.*

C. *Fish and wildlife habitat.*

- (1) *Structures such as bridges, culverts, and utility corridors shall be designed so they do not impede the passage of fish and wildlife.*
- (2) *New developments and uses shall not interfere with fish passage.*
- (3) *Filling of shallow-water fishery habitat shall be allowed only after an analysis shows that no other practicable sites exist. Filling shall only be considered for water-dependent uses, and mitigation shall be required.*
- (4) *New developments and uses shall occur during periods when fish and wildlife are least sensitive to activities. These would include, among others, nesting and brooding periods (from nest building to fledgling of young) and those periods specified in "Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources" (Oregon Department of Fish and Wildlife, 1986).*
- (5) *In areas of big game winter range, adequate thermal cover shall be maintained, as determined by the appropriate state wildlife agency.*
- (6) *Forest practices shall maintain the following:*
  - (a) *Six live trees per acre, three of which shall be of the largest tree size available and three of which shall be of various sizes to provide replacements as snags and wildlife trees; and three dead trees per acre, of the largest tree size available; and three down trees per acre, of the largest tree size available. All trees shall be unburned.*

*In areas with mixed oak and conifer stands, at least one of the three dead trees per acre shall be an oak snag of the largest tree*



*size, and one additional live conifer per acre of 16-inch dbh (diameter at breast height) or greater, preferably with limbs down to the ground, shall be maintained.*

- (b) Snags and wildlife trees shall be maintained either as clumps or evenly distributed over the forest practice area.*
- (c) Down logs shall be relatively solid, and no area greater than two acres in size and capable of supporting forested conditions shall be without a minimum of two down logs.*

*D. Biodiversity.*

- (1) New uses shall avoid disturbance to old growth forests.*
- (2) Forest practices shall maintain species composition at existing proportions in the activity area.*
- (3) Forest practices in areas with existing oak species shall maintain a minimum of 25-square-foot basal area per acre of oak in areas with predominantly oak trees of 1-foot dbh or more, or maintain a minimum 40 percent oak canopy cover per 40 acres, in which 10 trees per acre must be the largest tree size, in areas with predominantly oak trees less than 1-foot dbh. No area greater than 10 acres in size and supporting existing oak species shall be devoid of oak trees.*
- (4) A mix in age and size of hardwoods shall be maintained to provide for vertical diversity and replacement.*
- (5) For revegetation purposes, only plant species native to the Columbia River Gorge shall be encouraged.*

### **3.4.1 Vegetation**

The majority of the trees in the study area are native species, with Oregon black cottonwood (*Populus trichocarpa*) the most common species. Other species observed include Pacific willow (*Salix* sp.), Oregon white oak (*Quercus garryana*), red alder (*Alnus rubra*), western red cedar (*Thuja plicata*), Douglas fir (*Pseudotsuga menziesii*), big leaf maple (*Acer macrophyllum*), and red-osier dogwood (*Cornus stolonifera*). Non-native trees are rare on the site and include one large white mulberry tree (*Morus alba*), some sweet cherry (*Prunus avium*), and a few European white birch (*Betula* sp.) found on the Delta.

The most common shrub is a non-native: Himalayan blackberry (*Rubus discolor*). Himalayan blackberry is widely established and is continuing to spread on the site in forest understories and clearings, along waterways, and in open pastures. Most other shrub species observed in the project area are natives and include: snowberry (*Symphoricarpos albus*), Nootka rose (*Rosa nutkana*), several willow species (*Salix* sp.), and Douglas spirea (*Spirea douglasii*).

Native forbs and grasses have been largely replaced by non-natives due to clearing, agricultural uses, road construction and other disturbances. Some of the forested areas of the site have retained the primary native herbaceous layer in the understory, but most open areas are now dominated by non-natives or noxious weeds.

The Interim Management Strategy for National Forest Lands on the Delta specifies the use of biological controls for noxious weeds on the site. The FS has used flea beetles and cinnabar moths to control tansy ragwort on the site. However, effective biological controls are not available for some noxious weeds (e.g. bull thistle).

### ***Sensitive, Threatened, and Endangered Plant Species***

The USFWS indicated that Bradshaw's lomatium (*Lomatium bradshawii*), howellia (*Howellia aquatilis*), white-top aster (*Aster curtus*), tall bugbane (*Cimicifuga elata*), pale larkspur (*Delphinium leucophaeum*), peacock larkspur (*D. pavonaceum*), white meconella (*Meconella oregana*), Howell's montia (*Montia howellii*), Columbia cress (*Rorippa columbia*), and Oregon sullivantia (*Sullivantia oregana*) could potentially occur in the Sandy River Delta study area. Of these species, only Columbia cress has been observed within the study area. Two colonies of Columbia cress (federal candidate) were found along the Columbia River shoreline. Woolgrass (a forest sensitive species) was sighted along the edges of seasonal ponds on the southwest portion of the Delta.

The NSA also recognizes and offers protection to species listed by the State of Oregon as sensitive, threatened, or endangered. Table 3.4-1 lists the state, federal, and Mt. Hood Forest STE species potentially occurring in the study area and their habitat requirements.

### **3.4.2 Wildlife and Wildlife Habitat**

Wildlife species and their use of the study area are quite diverse due to the wide variation of habitat types, the large amount of edge habitats, the presence of seasonal and permanent water features, the area's size, connectivity to the Sandy and Columbia River corridors, and the proximity to Gary and Flag islands and the Steigerwald National Wildlife Refuge.

The Delta is located in the Pacific flyway and is used by migratory birds as resting or nesting grounds during migration. This area is also used as nesting and wintering grounds by resident and transient wildlife.

The Delta subarea is effectively an island surrounded on two sides by rivers and a four-lane highway (I-84) on the third. I-84 acts as a significant barrier to all terrestrial wildlife species, limiting not only terrestrial mobility but representing a life-threatening hazard to animals crossing I-84 when moving to and from the forested habitat to the south of the site. However, terrestrial wildlife such as turtles, salamanders, and deer will migrate to and from the Delta by swimming across the rivers.

**TABLE 3.4-1**  
**SENSITIVE, THREATENED, AND ENDANGERED PLANT SPECIES**  
**POTENTIALLY OCCURRING AT THE SANDY RIVER DELTA**

COMMON NAME	SCIENTIFIC NAME	HABITAT REQUIREMENTS	FEDERAL STATUS
white-top aster	<i>Aster curtus</i>	valley grasslands	C2
bristly sedge	<i>Carex comosa</i>	marshes, wet meadows	
porcupine sedge	<i>Carex hystricina</i>	wet ground near streams	
retorse sedge	<i>Carex retrorsa</i>	sunny wetlands	
tall bugbane	<i>Cimicifuga elata</i>	moist shady forests at "lower" elevations	C2
pale larkspur	<i>Delphinium leucophaeum</i>	cliffs and ledges	C2
peacock larkspur	<i>Delphinium pavonaceum</i>	meadowlands in central Willamette Valley	C1
howellia	<i>Howellia aquatilis</i>	vernal pools	T,S
Kellogg's dwarf rush	<i>Juncus kelloggii</i>	damp/wet areas	
Bradshaw's lomatium	<i>Lomatium bradshawii</i>	wet, open areas of Willamette Valley	E
white meconella	<i>Meconella oregana</i>	grassy wet meadows	C2,S
timwort	<i>Microcala quadrangularis</i>	moist prairies	
Howell's montia	<i>Montia howellii</i>	moist forests	
Columbia cress*	<i>Rorippa columbiae</i>	Columbia River shoreline	C2,S
woolgrass*	<i>Scirpus cyperinus</i>	pools, wetlands	S
Oregon sullivantia	<i>Sullivantia oregana</i>	shaded, perpetually wet, rocky areas. usually within the spray zone of a waterfall	C2,S
small-flowered trillium	<i>Trillium parviflorum</i>	woods	
humped bladderwort	<i>Utricularia gibba</i>	pools	
lesser bladderwort	<i>Utricularia minor</i>	pools	S
Columbia water-meal	<i>Wolffia columbiana</i>	pools	S
dotted water-meal	<i>Wolffia punctata</i>	pools	

S = Mt. Hood Forest Sensitive Species

\* Species observed growing on the Sandy River Delta

C1 = Federal Candidate 1 Species  
C2 = Federal Candidate 2 Species  
T = Threatened Species  
E = Endangered Species

Source: Salix Associates, 1992.

The use of that portion of the study area south of I-84 is largely limited to bird and amphibian species. The area is confined by two transportation corridors and has marginal habitat value for deer and other larger species. Amphibian habitat is limited to the forested wetland, ODOT mitigation wetland, and the eastern portion of the site along the foot of the bluff. The deciduous forested areas serve as avian habitat.

Habitat types on the Delta are based on general cover type categories for vegetation and other features and subcategories based on factors important to wildlife. (See Table 3.4-2). These habitat types include upland and wetland forest, scrub-shrub wetland and upland, wet and upland meadow, seasonal and permanent water features, river slough, and flat and steep river shoreline, and savannah. Existing habitat acreages are listed in Table 2.3-1 in Chapter 2.0. Alternative 1 (Figure 2.3-1) graphically shows the existing habitat types.

### ***Sensitive, Threatened, and Endangered Wildlife Species***

All of the species of concern listed by the Oregon Natural Heritage Program and ODFW and USFWS were inventoried for the Delta. Their habitat requirements and presence are documented in Table 3.4-3. The species on these two lists provide a good representation of the different wildlife that potentially would use the Delta study area. There is the potential for STE wildlife species to occur within the Delta subarea (see Table 3.4-3). Eight bird and two herptile species have been observed on the site. No STE mammals are known to occur on the Delta. A pair of breeding bald eagles nest in the study area. These eagles forage along the Columbia River and probably use the shoreline of the Delta for foraging and perching.

There is the potential for STE wildlife species to occur in the portion of the study area south of I-84. No STE species have been observed in this area although suitable habitat is present for the painted turtle, western pond turtle, red-legged frog, pileated woodpecker, and Lewis' woodpecker.

The USFWS (June 29, 1994) listed the following wildlife species as having the potential to occur in the Sandy River Delta project area: bald eagle, peregrine falcon, Pacific big-eared bat, tricolored blackbird, northwestern pond turtle, northern red-legged frog, and spotted frog. The potential impacts this project may have on these species have been analyzed in a Biological Assessment in compliance with Section 7 of the Endangered Species Act. Of all the species listed, only the bald eagle and northern red-legged frog have been documented as occurring on the site.



**TABLE 3.4-2  
HABITAT TYPES AT SANDY RIVER DELTA**

<b>COVER TYPE</b>	<b>DOMINANT VEGETATION OR FEATURES</b>		<b>WILDLIFE USAGE</b>
Forest	Upland	black cottonwood	Many large and small mammals, herptiles, and birds use this habitat heavily for cover, foraging, and breeding areas.
	Wetland	black cottonwood; Pacific willow	Many large and small mammals, waterfowl, herptiles, song birds, and wading birds use this habitat type.
Savannah		Oregon white oak	Songbirds, raptors, and small mammals use this habitat type.
Shrubland	Upland	rose spp.; blackberry spp.; snowberry	Songbirds and small mammals frequently use this habitat type.
	Wetland	willow sp.; dogwood	Waterfowl, wading and shore birds, and small mammals are the principal users.
Meadow	Upland	<b>Native dominants:</b> none <b>Non-native dominants:</b> fescue spp.; Kentucky bluegrass; bentgrass; brome spp.; sweet vernal grass	Large and small mammals, songbirds, raptors, and reptiles
	Wetland	<b>Native dominants:</b> water foxtail; bentgrass sp. <b>Non-native dominants:</b> reed canary grass; bentgrass sp.	Waterfowl, amphibians, wading birds, and small mammals use this habitat for nesting grounds during migration, breeding grounds, and year-round use.
Water Feature	Seasonal	Pond (<20 ac.)	Seasonal water features are mainly used by a variety of wildlife as a water source. Good breeding grounds for insects that provide a food source.
	Permanent	Pond (<20 ac.)	Pond and slough are important year round water source. Warm water fish such as bluegill. Amphibians, wading birds, waterfowl, and small mammals such as beaver, nutria, and muskrats also inhabit this area.
		Slough	
		River	Columbia and Sandy Rivers are important migratory routes for anadromous fish and wildlife. A variety of wildlife nest/breed along the banks.
River Shoreline	Flat	<5% slope	Wildlife se shorelines as access to water sources. Shorebirds and waterfowl use some flat shorelines as foraging grounds.
	Steep	>5% slope	

*Note:* Specific wildlife species are listed in the Natural Resources Technical Memorandum in the project file.

*Source:* Salix Associates, 1992.

**TABLE 3.4-3  
SENSITIVE, THREATENED, OR ENDANGERED WILDLIFE SPECIES  
AND OCCURRENCE AT THE SANDY RIVER DELTA**

<i>COMMON NAME</i>	<i>HABITAT REQUIREMENTS</i>	<i>SUB-AREA WHERE OBSERVED (IF ANY)</i>	<i>FEDERAL STATUS</i>
<b>Birds</b>			
Pacific loon	winters on the Columbia		
red-necked grebe	winters on the Columbia		S
horned grebe	winters on the Columbia		S
great egret	permanent resident or wintering in water areas shorelines or wetlands	Slough	
cackling Canada goose	permanent resident or wintering in wetlands or water areas	Slough, Thousand Acres	
ring-necked duck	permanent resident or wintering in wetlands or water areas	Thousand Acres	
lesser scaup	permanent resident or winters on Columbia		
bufflehead	permanent resident or wintering	Thousand Acres	S
greater sandhill crane	permanent resident or wintering	Slough	S, S
semi-palmated plover	shorelines may be used during migration		
greater yellowlegs	permanent or migrant resident of wetlands and shorelines	Thousand Acres	
Caspian tern	summer resident of water areas and shorelines		
bald eagles	permanent resident of the area; forages along shoreline	Sun Dial; Thousand Acres	T, S
black-shouldered kite	permanent resident of fields and wetlands		
merlin	permanent resident of open fields		
yellow-billed cuckoo	summer resident of dense riparian areas		S
northern pygmy owl	permanent resident of woodlands		S
northern saw-whet owl	permanent resident of woodlands		

<i>COMMON NAME</i>	<i>HABITAT REQUIREMENTS</i>	<i>SUB-AREA WHERE OBSERVED (IF ANY)</i>	<i>FEDERAL STATUS</i>
acorn woodpecker	permanent resident of oak groves (would be rare on delta)		S
Lewis' woodpecker	permanent resident in groves of large trees (would be rare on Delta)		S
pileated woodpecker	permanent resident, but may only winter on site	Thousand Acres	S
purple martin	summer resident near water		S
bank swallow	nest in steep banks near water; suitable habitat on Columbia and Sandy shorelines		S
western bluebird	permanent resident; pastures, open fields		S
loggerhead shrike	summer resident; rare in western Oregon		
tricolored blackbird	wet meadows		C2
<b>Herptiles</b>			
northern red-legged frog	cool seasonal and permanent ponds with adjacent woods and shrublands	Thousand Acres	C2, S
painted turtle	ponds and sloughs with basking logs, warm temperatures; sandy soils nearby for breeding	Slough, Thousand Acres	S
northern western pond turtle	ponds and sloughs with basking logs, warm temperatures; sandy soils nearby for breeding		C2
spotted frog	High Cascade lakes with considerable emergent vegetation and a layer of dead and decaying vegetation		C1
<b>Mammals</b>			
Pacific western big-eared bat	rock crevices, caves, mines, abandoned buildings		C2

*S* = Mt. Hood Forest Sensitive Species

*C1* = Federal Candidate 1 Species

*C2* = Federal Candidate 2 Species

*T* = Threatened Species

*E* = Endangered Species

Source: Salix Associates, 1992; and DEA field observations.

### *Exotic Wildlife Species*

The introduction of exotic species has impacted native wildlife through predation and competition. Several exotic species have been introduced to the study area including bullfrogs and small-mouthed bass. These species now inhabit the ponds, wetlands, and the slough. All of these species are predators of native fish, amphibian larvae, and young turtles.

#### **3.4.3 Fisheries**

The lowest three miles of the Sandy River form the western boundary of the study area. This portion of the river is characterized by low gradient, low velocity, seasonal low flows, seasonal high temperatures, and a sandy, silty substrate. These factors, individually or in combination, favor warm water fish species such as bass, crappie, bluegill, shad and smelt. These same factors limit spawning and rearing habitat for salmon and trout species, but a number of anadromous species pass through the study area to up-river spawning grounds.

The Sandy River originates in the glaciers of Mt. Hood. For most of its course to the Columbia, the Sandy flows in a moderate to steep gradient. The low gradient of the last few river miles allows build up of sand and gravel bars along the banks and backwaters. The Sandy River gets its name from this accumulation of sand.

The low gradient in the lower Sandy affects fish habitat. The gradient in the lower 17 miles averages only 9 feet per mile (0.17 percent slope). The low gradient and low water velocity allow glacial silt to deposit in the river bed. The build up of silt and sand over the gravel beds provides little spawning gravel. In the lower three miles of the Sandy, the bottom is almost entirely sand and silt, providing spawning habitat for only shad and smelt.

Lower river temperatures range from 55 F to 70 F in low-flow months (August and September), when the mean discharge is 550 cfs. The mixing of Columbia River flow with Sandy River flow at the mouth contributes to increased water temperatures. Temperatures at the upper end of this range are not favorable to salmonid spawning or rearing.

Warm-water game species such as large-mouth bass, crappie, and bluegill are restricted to the Columbia River backwaters east and west of the Sandy's mouth. Northern squawfish and peamouth chub are found only in the extreme lower river, where mixing of the Sandy and Columbia River water brings temperatures up to their habitat requirements.

Coho salmon, fall chinook salmon, and winter steelhead pass through the study area at various seasons to and from up-river spawning habitat. Native runs of these fish are augmented by hatchery stocks. The native spring chinook has been greatly reduced, and is supplemented by hatchery stocks. Summer steelhead is stocked in the upper reaches. Since ODFW does not expect this stock to reproduce naturally, migration through the study area is not expected (ODFW, 1990).



Some anadromous species are migrating through the study area throughout the year.

The banks of the Sandy River are popular with anglers for small-mouth bass, carp, and other species that frequent the slough. The Sandy River shoreline is a very popular fishing spot during salmon and steelhead runs, and anglers will occasionally fish for salmon on the Columbia River shoreline as well.

The Columbia and Sandy Rivers contain the only nearby habitat for cold water fish. Although the rivers are not within the boundaries of the federally owned portion of the study area, they contribute greatly to the habitat diversity. Fish and fish habitat issues have been studied extensively in these two river systems. The slough, also not federally owned, contains warm water habitat utilized by fish entering from the Columbia River.

A list of current resident fish species of the Sandy River basin is provided in Appendix E. This list is considered to be accurate, but there may be additional native and non-native species that swim in the basin's lower reaches.

The lower Sandy River is currently heavily used for recreation. A high level of human activity typically affects fish habitat by reducing the amount of riparian vegetation and increasing the erosion of streambanks. This is happening along the banks of the Sandy River. Frequent use by anglers and others trying to get access to the river have created trails which have removed riparian vegetation and make the bank susceptible to erosion.

### ***Sensitive, Threatened, and Endangered Fish***

The USFWS indicated that Snake River Chinook salmon (a federally listed threatened species) and Snake River sockeye salmon (a federally listed endangered species) may have the potential to occur in the Sandy River Delta project area (USFWS, 1994). The project area is within designated critical habitat for the salmon (300 feet landward from the ordinary high water mark along the Columbia River).

The Snake River sockeye salmon spring and summer runs and fall Snake River Chinook salmon migrate through the Columbia River from the Pacific Ocean to spawning grounds in Idaho. These three runs of fish do not pass through the Sandy River.

## **3.5 CULTURAL RESOURCES**

Cultural resources include the remains and records of the past which are at least 50 years old, as well as sites, places, and values of cultural or religious importance. These resources are important for their potential to provide an understanding of long-term human adaptation, as well as information regarding patterns of history and culture. Such cultural resources are recorded as "historic properties" or "historic resources," which includes any prehistoric or

historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). Eligible properties include both properties formally determined as such by the Secretary of the Interior and all other properties that meet NRHP listing criteria (36 CFR 60.4).

Cultural resources investigations of the study area included archaeological surveys and a review of previous surveys of the area, and documentary records and reports on the history of the Sandy River Delta and the adjacent areas, including the ODOT Triangle and Lewis and Clark State Park, and I-84 ROW. The technical memorandum containing details on the cultural resources survey is in the project analysis file.

Consultation was carried out by the FS during the course of the project with the chairman of each of the following tribal governments: the Confederated Tribes of the Umatilla Indian Reservation, The Yakama Indian Nation, the Confederated Tribes of the Warm Springs of Oregon, and the Nez Perce Tribe. These tribal governments were also solicited for information about traditional uses and their potential knowledge of cultural resources of the study area and tribal members from these tribes were invited to participate in archaeological surveys. Consultation is further described in the Cultural Resources Technical Report in the project analysis file.

### **3.5.1 Cultural History**

The Umatilla Tribes performed a search for tribal elders knowledgeable about the study area and conducted a literature review and search of their records for information specific to the study area. Their efforts located no specific information, other than that the area was generally known to be a good place to fish for smelt. A Yakama Indian Nation tribal member provided information regarding the use of the Delta during the 1940s and 1950s by another Yakama tribal member for gathering medicinal plants and for fishing (Eli, pers. comm., 1992).

The first detailed information on the study area is provided in the written journals of Meriwether Lewis and William Clark when they and members of their expedition traversed the area in November, 1805, and March and April, 1806. Their journals noted the Sandy River, which they called "Quicksand River", had two mouths. In their explorations on November 3, 1805, they described the river as flowing through two channels, with several small islands about one mile up the Sandy from its mouth, and having a 3-mile-long sand bar island 1-1/2 miles wide "in its mouth." The area abounded with wildlife at that time: a large quantity and variety of birds were observed, great numbers of sea otter were seen in the river, and in April, 1806, they hunted the area in search of food while encamped across the Columbia for several days, killing elk, deer, and a black bear. The food plants they described included edible berries and roots, particularly wappato. Notably, between the time of their original passing through the area in November, 1805, and their return in April 1806, the Columbia River had risen 12 feet (Thwaites, 1905, Moulton, 1990).

Included in their descriptions of the area were encounters with Native Americans, however no camp sites or village sites were noted. The local people told Lewis and Clark that the Sandy was navigable only for a short distance because of falls and rapids and that no Indian "nation" inhabited it. Several villages along the Columbia River appeared to have been abandoned, and when the remaining inhabitants were questioned about what had become of the former occupants, it was explained that they had died from a disease that left pox marks on those who survived the illness. As other anthropologists have pointed out, the number of people along the river may have been substantially less during the time of the visit by the Lewis and Clark Expedition than during late prehistoric times (Boyd, 1985, 1990; Boyd and Hajda, 1987).

The setting for the study area as recorded in the journals of Lewis and Clark remained much the same through the 1800s. A landing on the west side of the mouth of the Little Sandy River, known as Stott's Landing, served as a disembarkation point for pioneers floating down the Columbia River from The Dalles en route to settle in the Willamette Valley. By 1852, a ferry business had been established to transport Willamette Valley-bound settlers from the Cascades on the Columbia River to a point opposite the Sandy River. Passengers were then ferried across the Columbia to the west side of the mouth of the Little Sandy River where wagon roads connected the Sandy River to the settlements at Portland, Oregon City, and other parts of the Willamette Valley.

Ferry transportation across the Sandy River persisted until about 1900. The historic road on the east side of the Sandy River (south of I-84) and the east-side ferry landing was sited in the location of the Lewis and Clark State Park boat landing.

Because of the Sandy River landing, a small community developed near the present site of Troutdale. The settlement was known as Sandy, but the community did not survive and its name was later given to the town of Sandy which is located a considerable distance upstream. The west side of the Sandy River was settled rapidly through donation land claims (DLCs). The Delta east of the present-day Sandy River was slower to be settled primarily because of the threat of flooding. A large portion of the Delta was claimed by Felix G. Hicklin in 1851, with other small claims east and west of Hicklin's DLC. Early land survey maps depict Hicklin's DLC and the surrounding area as including level prairie land and stands of cedar, fir, hemlock, and maples. An undergrowth of vine maple, hazel, and briars was also noted. The soil in the wooded areas was described as "third rate" and the land "rough." Hicklin extended his land holdings in 1865, purchasing a parcel of land that became the location of his house and associated buildings. Eventually, the Hicklins owned all of the land south and east of the old channel of the Sandy River below Broughton Bluff.

The 1,825-acre Sun Dial Ranch encompassed the west side of the Sandy River and included "Sun Dial Island." The Sun Dial Ranch, established in 1905, was in a prime location for shipping produce to markets because of its proximity to Portland and to major transportation corridors. Sun Dial Island was located between the former main channel of the Sandy River and Little Sandy River (i.e., the northern portion of the study area). This northern part of the Delta is formed of many ridges and swales. A wide slough or wash (Hourglass Slough),



extending east to west through the middle of the island, was once the moorage for a fishwheel scow owned by Doaky Jones, although this is near the downstream limits that fishwheels were used. Fishwheels were outlawed in Oregon in 1926.

Gary Island, on the eastern edge of the study area, was named after Theodore J. Gary, who was a prominent educator in the Portland School District. Gary owned the island as early as 1904 and was still listed as the major property owner in 1944. Around the early 1910s, the island was used for grazing and a house and barn were built. Portions of the island were cleared of timber which was shipped by barge down the Columbia. A small section was planted in root crops such as potatoes and turnips. Private parties would often rent this island for sport fishing, hunting, and camping. By 1941, the island had split into two islands, Gary and Flag islands.

The Oregon Railway and Navigation Company (ORNC) Railroad was completed in 1882 and linked the Columbia River Gorge to Portland, the Willamette Valley, and the eastern states. The railroad remains in the same location as when it was constructed more than 100 years ago.

Although the study area was used primarily for agriculture during most of its Euro-American history, it was also extensively used by hunters and fishermen. Three small lakes on the eastern edge of the Delta were used extensively for fishing and duck hunting, and a small cabin was reportedly built prior to 1920 adjacent to the lakes for rental to hunters. Fishing for salmon, steelhead, shad, and smelt (or Eulachon) was popular in the Sandy River. The annual run of smelt became an important economic factor to the Sandy River region; however, by the mid-1910s a decline in both the salmon and smelt runs had caused concern. This interest in stability of the fish runs initiated construction of the most extensive historic feature that remains on the Delta today -- a dam across the historic channel of the Sandy River.

Plans for the re-channeling of the Sandy River were proposed as early as 1913 by the Oregon Fish Commission. ACOE agreed that the Little Sandy River should become the main channel because of its natural high banks and its angle of flow. It took almost 30 years to resolve funding and easements to complete the construction. The final impetus for improving the river occurred in 1931 when no smelt entered the Sandy River. This prompted action by the Game Commission to use the funds raised from the smelt license fees for construction of a dam in the main branch of the Sandy River near its confluence with the Little Sandy River. Construction of the 750-foot long, five-foot wide dam began in 1931 after securing an easement from the Sun Dial Ranch, and was completed in 1932. The dam is constructed of boulders, with shaped stones providing a level top which can be used by vehicles. It is not impermeable, and high river flows pass through and over it. Despite the construction of the dam, the smelt runs between 1932 and 1935 were minimal.

Improvements to the dam were completed in 1938, but there were no smelt runs in 1938-39, causing the Troutdale Rod and Gun Club to promote dredging work on the Sandy River. Work was completed in February 1941. The 1941 smelt run was a success; all the fish came through the new channel. In 1944-45, additional work was completed on the deck of the dam.



The Sandy River dam has been recorded as an historic site and in 1992 the Oregon State Historic Preservation Officer determined it to be eligible for listing in the NRHP.

A majority of "A Thousand Acres" was purchased by Paul and Verla Martin by 1946, including the original Hicklin ranch buildings. A borrow area or gravel pit adjacent to the north side of I-84 on the east side of the Sandy River probably relates to construction of the original state highway which preceded I-84. A concrete curb found a short distance west of the inverted-Y canals and a few hundred meters north of the highway is probably related to construction of the highway or dairy operations on the site and is not considered to be a cultural resource site due to its recent age. Dikes and levee embankments that extend around the east, west, and north perimeter of the Delta were built between 1941 and 1952 to help control flooding. While these features relate to the history of "A Thousand Acres", they are not of major historical importance.

The Martins sold acreage to the State of Oregon in 1951, probably including the land where the ranch buildings were located, and from which Lewis and Clark State Park was developed. Campsites and recreational vehicle (RV) parking developed as part of the park included landscape modifications further altering the Hicklin Ranch. In 1978, the camping sites were removed and filled. The area between the railroad tracks and I-84 was used for off-road vehicles (ORV) from sometime in the 1960's until recently.

### **3.5.2 Cultural Resources**

Archaeological surveys and the literature review reveal that both historical and prehistoric sites are located within the study area. Prehistoric sites identified elsewhere on the Columbia River floodplain are usually found above 20 feet in elevation, although sites may be found eroding from exposures of the riverbank at lower elevations.

The Sandy River Delta study area contains several potential locations for prehistoric sites above 30 feet in elevation, and a few areas that are greater than 40 feet. Most, but not all, of these areas are associated with ponds, sloughs, old channels, or other former wetland areas. These areas would have a relatively high probability for containing evidence of prehistoric uses. Sun Dial Island contains several patches of relatively high ground. The shoreline adjacent to the Columbia River along the east side of the study area contains a long stretch of relatively high ground with small patches reaching 40 feet and higher.

#### ***Prehistoric Cultural Resources***

Site 35MU76 and Temporary Site/Isolate #92/91-1 are the only known prehistoric resource sites within the project area. The 92/91-1 site consists of pieces of fire-cracked rock and is considered to be an "isolate" by SHPO. As such, it is not an historic property and is not eligible for listing on the NRHP. Site 35MU76 was recorded in 1988. It is presently suffering from erosion and recreation uses and has been determined eligible for listing on the NRHP.

Local informants have said that cultural materials have been found near the present mouth of the Sandy River, but no fire-cracked rocks or other materials attributable to habitation sites have been found in association with these artifacts. These artifacts are associated with fishing activities and may indicate previous use of the area as a fishing station. Likewise, local tales suggest a rock shelter at the base of Broughton Bluff was covered by a rockslide sometime in antiquity, but there is nothing to substantiate this story.

### ***Historical Cultural Resources***

There are three recorded historic-period resource sites within the project's study area: the Sandy River dam bridging the historic Sandy River channel, the railroad, and the Hicklin Ranch. The railroad and railroad bridge is an historic resource, although components of it are undoubtedly modern. The Oregon Railway and Navigation Company's (OR&N) Columbia River main line (now owned by UPRR) was completed in 1882 and became part of the transcontinental railroad. The construction of the railroad bridge crossing the Sandy River dates to 1906, and is one of two through truss type bridges (Warren configuration). Both are recommended to be significant sites, the railroad alignment for its contribution to the broad pattern of events that shaped the Columbia River Gorge region and the Pacific Northwest, and the bridge for its engineering design.

One of the I-84 bridges across the Sandy River dates to the original highway, 1948, and will soon reach the age for consideration as an historic resource as well. Other dikes and levees and the remains of outbuildings near the I-84/Jordan Road interchange are not considered as historic properties because they are not of sufficient age (50 years). Searches were conducted for the purported fishwheel scow tie-up on a slough on the Sun Dial Island part of the Delta, but no pilings or other indicators were found, nor were remains of the hunting cabin in the area of the three ponds on the Delta.

Because of its historical significance, the Sandy River dam was preliminarily determined eligible for listing on the NRHP as part of a 1992 study for Northwest Pipeline Corporation. The dam reflected the national trend towards wildlife habitat restoration popular in the years of the Great Depression.

The Hicklin historical site was identified in 1994. The site is located within Lewis and Clark State Park. FS evaluation of the site recommended that it is not significant, because of the extensive disturbance and limited remaining cultural material. SHPO concurred with the FS evaluation (see Appendix G).

### **3.5.3 Cultural Resource Protection**

In addition to the CRGNSAA and cultural resource protection policies in the NSA Management plan, protection and management of cultural resources is provided by a variety of federal regulations, most notably the National Historic Preservation Act (NHPA); NEPA; Antiquities

Act of 1906; National Historic Preservation of 1966; Archaeological and Historic Preservation Act of 1974; Archaeological Resources Protection Act of 1979; American Indian Religious Freedom Act of 1978; the regulations for the Advisory Council on Historic Preservation (36 CFR Part 800); and Uniform Regulations for the Protection of Archaeological Resources (36 CFR Part 296). For federally funded transportation projects, Section 4(f) of the Department of Transportation Act also applies.

NEPA requires that effects on historic properties be considered as part of the environmental assessment process. Cultural resource inventories and evaluations are required by Forest Service policy (2360/1950 October 9, 1991) for all actions on National Forest land. The compliance process (36 CFR 800) includes consultation with the State Historic Preservation Office (SHPO) and the Advisory Council on Historic Preservation (ACHP).

Section 106 of the NHPA (36 CFR Part 800) requires special review of any undertaking that could affect historic properties or resources which are included in or eligible for the NRHP. All historical resources are evaluated to determine eligibility for the NRHP. Eligibility identifies resources that are worthy of protection, preservation, and enhancement. If a property is not eligible for inclusion in the NRHP, it is not a historic property for purposes of the NHPA. The significance of historic resources is measured through the use of eligibility criteria established in 36 CFR 60.4. An historic property is considered NRHP-eligible if it meets one of the following criteria and possesses integrity:

- Association with events that have made a significant contribution to the broad patterns of our history;
- Association with lives of persons significant in the past;
- That embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; possess highly artistic values; or represent a distinguishable entity whose components lack individual distinction;
- That have yielded or may be likely to yield information important to history or prehistory.

The NSA Management Plan requires that no action have an adverse impact on a cultural resource that is eligible for the NRHP.

### **3.6 LAND USE AND PLANNING**

#### **3.6.1 Existing Land Uses on the Site**

The study area contains evidence of past human activity, largely focused around farming and fishing. Existing uses include informal recreational uses and utility transmission corridors (see

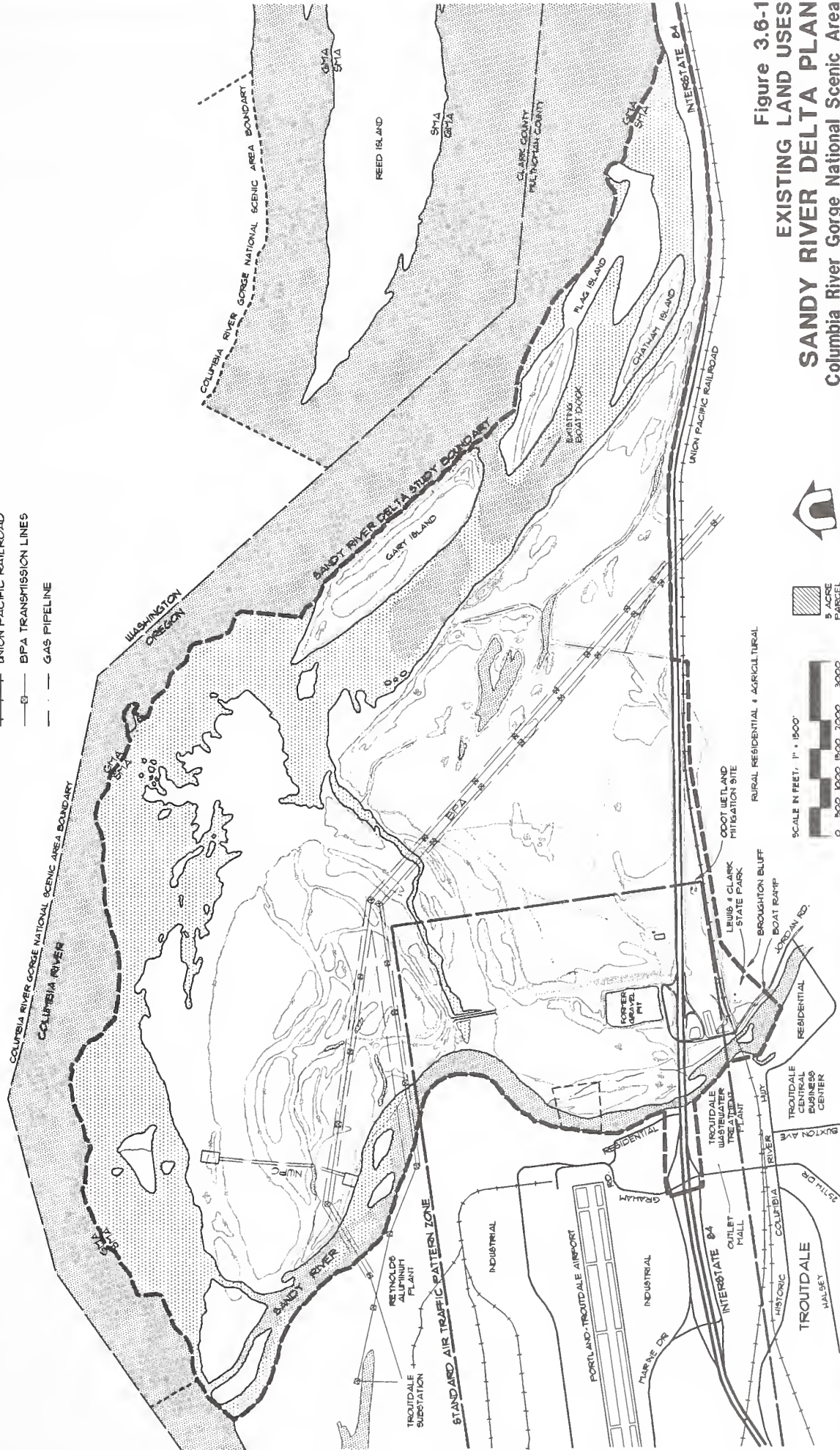




DAVID EVANS AND ASSOCIATES, INC.

# LEGEND

- SANDY RIVER DELTA STUDY BOUNDARY
- STATE BOUNDARY
- UNION PACIFIC RAILROAD
- BPA TRANSMISSION LINES
- GAS PIPELINE
- SANDBAR AREA (USGS)
- OPEN WATER (USGS)



SCALE IN FEET, 1" = 1500'

0 500 1000 1500 2000 3000

**Figure 3.6-1**  
**EXISTING LAND USES**  
**SANDY RIVER DELTA PLAN**  
 Columbia River Gorge National Scenic Area





Figure 3.6-1). Historic uses of the study area are detailed in Section 3.5, Cultural Resources; recreation uses are described more fully in Section 3.7, Recreation; and site access and parking are discussed in Section 3.9, Transportation.

The Columbia and Sandy rivers are partially included in the study area and also form the northern and western boundaries of the study area. The Columbia River is a major shipping route for agricultural goods produced in eastern Oregon and Washington. In the past, there were several aggregate extraction operations mining sand and gravel in the reach of the Sandy River within the study area. These operations were terminated due to concerns over impacts to anadromous fish and as a result of the inclusion of the river in the NSA. Upstream of the site, the Sandy River is designated as a federal and state Wild and Scenic River.

BPA has two parallel power line right-of-way easements which cross the Delta subarea. The right-of-way easement is 400 feet in width and includes 23 towers supporting high-voltage transmission lines (500 kV and 230 kV) which run from the Troutdale substation west of the Sandy River through the property to the southeast. BPA limits land uses and vegetation in its transmission easements to reduce the risk to people using the area and the risk of interrupting power to customers. Recreational development on the site should be designed to avoid these risks (e.g., people climbing the towers, hunters shooting the lines or capacitors, children flying kites into the lines, etc.).

High voltage transmission lines produce electromagnetic field effects (EMF) which can interrupt radio transmissions and interfere with electrical equipment operations. In recent years, there have been questions raised about the potential health effects to humans of exposure to EMF. Studies are underway to determine whether and to what extent there is a risk to humans. Until those studies are completed, BPA has adopted a "prudent avoidance" policy and discourages land uses in its rights-of-way which could increase human exposure to EMF. This will affect recreational development and land uses in the easement area. Where possible, trails should cross under the power lines at a perpendicular angle, and not parallel or diagonally to the power lines.

In addition to the BPA transmission lines, NWPC has an easement across the northern portion of the Delta for a high-pressure natural gas transmission line. This line carries natural gas from Canada through Washington and Oregon to California and crosses the Columbia River, the Delta, and then the Sandy River to provide service to the Portland Metropolitan Area. The pipe is buried at a depth of approximately 36 inches. Open space uses should not affect the pipeline. However, NWPC uses electromagnetic photography to monitor pipeline condition, which requires a clear area (no trees or large shrubs) over the right-of-way.

South of I-84, the ODOT Triangle and Lewis and Clark State Park subareas are divided by the UPRR. Uses within the ODOT Triangle include the southern half of the Jordan Road interchange, Jordan Road, ODOT's mitigation wetland, and a gravel parking area (used by OPRD for overflow parking). More information about park facilities is included in Section 3.7,

Recreation. Informal parking also occurs along Jordan Road and within the gravel area formed by the eastbound Jordan Road off-ramp loop.

The I-84 ROW portion of the study area (west of the river, and including I-84) is located within the City of Troutdale, and the Portland Metropolitan Area Urban Growth Boundary (UGB). The only uses in this area is the freeway. Adjacent land uses include the Troutdale sewage treatment plant, commercial, industrial, and residential development.

### **3.6.2 Surrounding Land Uses**

Directly across the river in the State of Washington are the towns of Camas and Washougal, both of which have industrial, commercial, and recreational uses along their waterfronts that are visible from the Delta site. In addition, the Steigerwald National Wildlife Refuge is located on the Columbia River floodplain across from the study area in Washougal. This refuge attracts a variety of migratory birds, as well as providing habitat for native species.

Across the Sandy River in the City of Troutdale, the existing land uses north of I-84 are predominantly industrial. (There is a small residential area directly north of the highway on the west side of the river.) Major industrial uses include BPA's Troutdale substation, the Reynolds Metals Company aluminum plant, and the Portland-Troutdale Airport. The commercial business district of Troutdale and the Columbia Gorge Outlet Stores are located south of I-84, west of the Sandy River. The Troutdale Wastewater Treatment Plant is located immediately south of the I-84 ROW subarea.

South of Lewis and Clark State Park is Broughton Bluff. The steep terrain in this area effectively separates the study area from residential and agricultural uses to the south. The community of Corbett, located southeast of the site, is accessed through the study area via Jordan Road and the HCRH. The alternative route to the community of Corbett is via I-84 eastbound to the Corbett Hill Road exit.

The Portland-Troutdale Airport is located adjacent to the study area west of the Sandy River and north of I-84. In 1989, this general aviation airport reported 137 aircraft registered there, and over 53,000 operations (takeoffs and landings). This translates to an average of 145 operations per day, or 12 per hour. Recent air traffic counts at the airport indicate that activity has doubled in the past five years to an average of 300 operations per day (111,000 annually). Airport operations are a major source of noise on the project site. The *Oregon Aviation System Plan* prepared by ODOT, Aeronautics Division, projects that in the year 2000, there will be 161 aircraft registered at the Portland-Troutdale Airport and a total of 120,000 operations annually. Operations at this airport are limited by the proximity to Portland International Airport (located approximately 10 miles west) and the need to avoid conflicts with commercial flights in and out of that facility. Figure 3.6-2 shows the Portland Troutdale Airport traffic zone of operations.



SOURCE: AIRPORT LAYOUT PLAN,  
HODGES & SHUTT, (DECEMBER 1990.)

NOTE: TRAFFIC USUALLY TAKES OFF  
AND LANDS VIA (07) DURING WINTER  
MONTHS, DUE TO STRONG EASTERLY  
WINDS OUT OF THE GORGE.

# LEGEND

- SANDY RIVER DELTA STUDY BOUNDARY
- STATE BOUNDARY
- UNION PACIFIC RAILROAD
- BPA TRANSMISSION LINES
- GAS PIPELINE
- SANDBAR AREA (USGS)
- OPEN WATER (USGS)
- AVIGATION EASEMENT
- RUNWAY PROTECTION ZONE
- STANDARD AIR TRAFFIC PATTERN ZONE

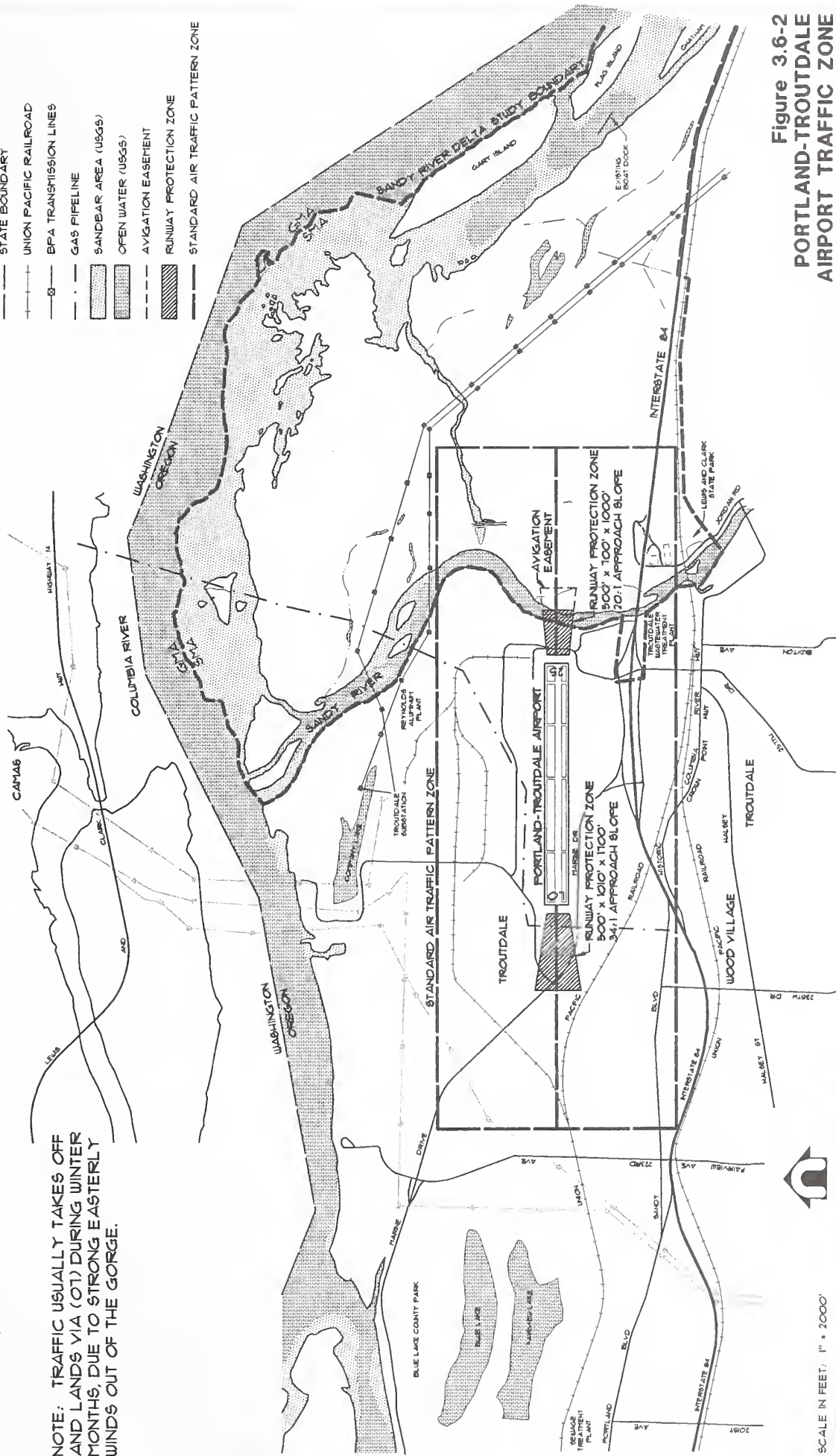


Figure 3.6-2  
PORTLAND-TROUTDALE  
AIRPORT TRAFFIC ZONE  
SANDY RIVER DELTA PLAN  
Columbia River Gorge National Scenic Area







DAVID EVANS AND ASSOCIATES, INC.

STIA: SPECIAL MANAGEMENT AREA (CRGNSA)  
GMA: GENERAL MANAGEMENT AREA (CRGNSA)

SOURCES: (CRGNSA) MANAGEMENT PLAN 1992  
MULTICOUNTY JOINT PLANNING ORDINANCE,  
CITY OF TROUTDALE DEVELOPMENT CODE.

## LEGEND

LAND USE DESIGNATIONS	
MULTICOUNTY COUNTY: _____	
CITY OF TROUTDALE	
<p>----- SANDY RIVER DELTA STUDY BOUNDARY</p> <p>..... GATEWAY SITE (RIC-4, PUBLIC RECREATION)</p> <p>----- BPA TRANSMISSION LINES</p> <p>----- GAS PIPELINE</p> <p>----- SANDBAR AREA (USGS)</p> <p>----- OPEN WATER (USGS)</p>	<p>           GSO: GORGE SPECIAL OPEN SPACE            GSPR: GORGE SPECIAL PUBLIC RECREATION            GGA: GORGE GENERAL AGRICULTURE            (70 ACRE MINIMUM LOT SIZE)            RIC: RECREATION INTENSITY            RIC1: VERY LOW INTENSITY RECREATION            RIC2: LOW INTENSITY RECREATION            RIC3: HIGH INTENSITY RECREATION            OUTSIDE (CRGNSA)            UF-20: URBAN FUTURE            (70 ACRE MINIMUM LOT SIZE)            HT1: URBAN HEAVY MANUFACTURING         </p>
	<p>           CBD: CENTRAL BUSINESS DISTRICT            GC: GENERAL COMMERCIAL            GI: INDUSTRIAL PARK            LI: LIGHT INDUSTRIAL            A-2: APARTMENTS            R-4: ATTACHED RESIDENTIAL            R-5: SINGLE FAMILY            ----- CITY OF TROUTDALE BOUNDARY            ----- LAND USE DESIGNATION LINES         </p>

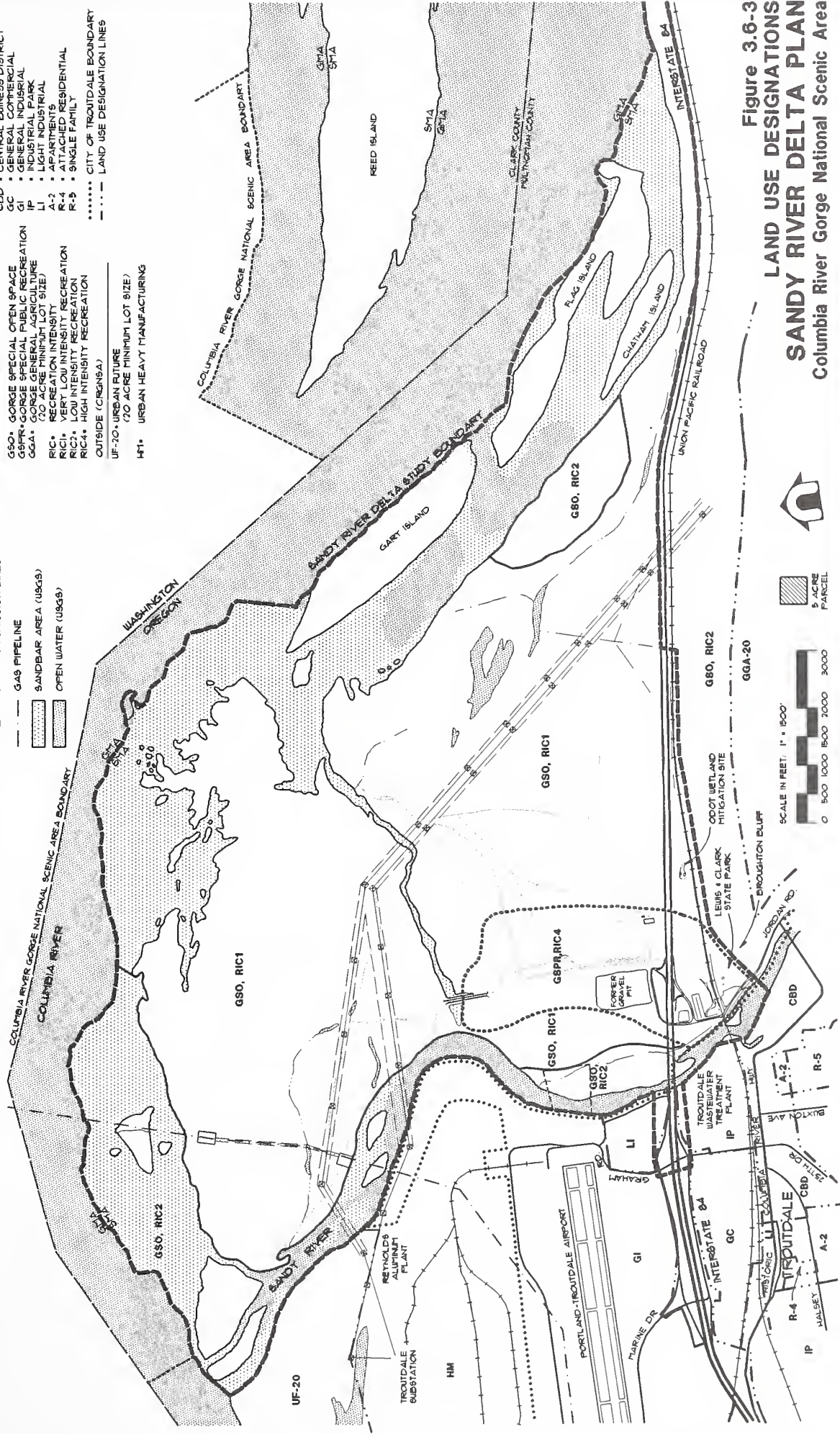


Figure 3.6-3  
LAND USE DESIGNATIONS  
SANDY RIVER DELTA PLAN  
Columbia River Gorge National Scenic Area



### 3.6.3 Plans, Policies and Regulations

The major plans, policies and regulations applicable to the study area include the Columbia River Gorge NSA Management Plan, Mt. Hood National Forest Plan, President's Plan, OPRD Columbia River Gorge District Master Plan, and Multnomah County implementing ordinances. These plans were introduced in Section 1.1.2, and are discussed in more detail below as they relate to the study area.

#### *Columbia River Gorge NSA Management Plan*

Figure 3.6-3 shows the FS, Multnomah County and Troutdale land use designations for the study area and immediately surrounding areas. Multnomah County and Troutdale regulations apply to non-federal land in the study area. The majority of the study area is designated by the NSA Management Plan as Open Space, with approximately 200 acres in the southwestern corner designated as Public Recreation. As discussed in Section 1.1, the Open Space area has a recreation intensity class (RIC) overlay of RIC 1 and RIC 2, and the Public Recreation Area has a RIC 4 overlay.

The SMA provisions for areas designated as Open Space are designed to protect and enhance areas with sensitive scenic, cultural, recreational, and/or natural resources. An open space plan must be developed for each designated open space area, and preparation of such a plan is a part of this study. Only maintenance, repair, and operation of existing dwellings, structures, trails, roads, railroads, and utility facilities is permitted in Open Space designations without review. The following new uses *may* be allowed, subject to review for compliance with scenic, cultural, natural, and recreational resource guidelines:

1. Changes in existing uses, including reconstruction, replacement, and expansion of existing structures and transportation facilities, except for commercial forest practices.
2. Structures or vegetation management activities, including scientific research, related to scenic, cultural, recreational, and natural resource enhancement projects.
3. Low-intensity recreation uses, including educational and interpretive facilities, consistent with the Recreation Intensity Class designation for the area.
4. Utility facilities for public service, if it can be shown that there is no alternative location with less adverse impact on Open Space land, and the size of the proposed facility is the minimum necessary to provide the service.
5. New signs, consistent with the policies and guidelines for such signs in the NSA Management Plan.



Sites designated for Public Recreation use are readily accessible to the public, lack hazards or highly sensitive resources, and offer significant potential for recreation use because of the availability of river access, the possibility of multiple recreation uses on one site, the scenic value of the site, or the potential to enhance other recreation opportunities (trails) or interpretation of the NSA's natural, scenic, or cultural features. All public recreation development in SMA areas must be natural resource-based. No new commercial recreation facilities are permitted.

The following uses are permitted outright (without review) on lands designated for Public Recreation:

1. Agricultural use, except where there would be potential impact to cultural or natural resources.
2. Maintenance, repair, and operation of existing dwellings, structures, trails, roads, railroads, utility facilities, and public recreation facilities.
3. Accessory structures less than 60 square feet in area and 18 feet in height measured at the roof peak.

The following uses may be allowed on lands designated for Public Recreation, subject to review for compliance with other NSA guidelines:

1. Forest uses and practices.
2. Public recreation facilities and public trails, consistent with the Recreation Resources identified in the Management Plan.
3. Public non-profit group camps, retreats, conference or educational centers, and interpretive facilities.
4. All dwellings and accessory structures larger than 60 square feet.
5. Home occupations and cottage industries.
6. Road and railroad construction and reconstruction.
7. Utility facilities for public service upon a showing that:
  - a. There is no alternative location with less adverse effect on Public Recreation Land.
  - b. The size is the minimum necessary to provide the service.
8. New signs.

9. Structures or vegetation management activities for the purpose of wildlife, fisheries, or plant habitat enhancement projects.
10. Agricultural review uses as defined in the Management Plan.

In addition to this general direction, the Recreation Development Plan for the NSA specifically designates the Public Recreation area of the site for the western gateway to the NSA. Gateway facilities are intended to:

1. Welcome and orient the visitor and provide tourist information. A primary purpose of the gateway is to disperse visitors throughout the Gorge, protecting easily accessible areas from overuse.
2. Offer exhibits on the features and resources in the vicinity of the facility.
3. Encourage visitors go to the main Interpretive Center near The Dalles (The Gorge Discovery Center) and provide programs complementary to that center.
4. Encourage visitors go to the Conference Center (Skamania Lodge) in Stevenson, Washington.

The specific development proposal for a gateway portion within the study area is:

*The site would serve as the southwest orientation and information gateway to the Columbia River Gorge. Facilities for picnicking, hiking, fishing access, and interpretation would be developed. The approximate design capacity is 350 to 500 persons at one time.*

*The site will be designed for use by a moderate to high number of people. Facilities will be mostly designed for the comfort and convenience of the users. Synthetic materials may be used in construction. Provision for emergency, law enforcement, and fire services is a major concern for this site and will have to be provided.*

The Multnomah County implementing regulations for Public Recreation areas also give specific dimensional requirements for new developments including minimum yard dimensions, maximum structure height, and minimum front lot line length. In addition, the county code requires an extensive site review process for the placement of a gateway facility in a non-federal public recreational area.

Any gateway at the site must comply with the Interpretive Strategy for the Columbia River Gorge National Scenic Area. The Interpretive Strategy identifies the following themes for the Sandy River Delta gateway:

1. The Columbia River and its scenic corridor have had a significant influence on natural and cultural patterns.
2. Through time, the Columbia River corridor continues to be a major influence on an evolving landscape of northwest cultures.
  - Early exploration of the Gorge and its tributaries had a major influence on cultures and the future northwest economy.
  - Canneries, fishwheels, and timber processing once presented a very different view of the western Gorge.
3. Because life within the Gorge depends on intricate linkages and dynamic relationships, stewardship of Gorge resources requires balancing human and natural needs.

The Interpretive Strategy envisions the possibility of provision of a staffed information desk, brochures, newspapers, maps, interpretive displays to introduce features and opportunities in the Gorge, orient visitors to recreational opportunities, explain local history, and provide access to the reservation system for local attractions. The gateway could also contain a sales area for interpretive materials. Landscaping should use native plants to interpret the vegetation of the Gorge. The site should be screened from the highway, but with adequate directional signing to assist visitors.

The Recreation Development Plan also proposes a trail within the study area -- the Sandy River Delta Trail (#T28). This trail is intended to incorporate hiking trails with opportunities for scenic appreciation and interpretation facilities. Four miles of new trail were envisioned, primarily on National Forest System Lands, to provide an easy hike through a pastoral and riverfront setting with many fine views and opportunities for interpretation. An extension of the trail to the east to Corbett Station would provide a loop opportunity back to Lewis and Clark State Park.

### ***Other Applicable Policies and Regulations***

**Mt. Hood Land and Resource Management Plan.** In addition to the requirements of the NSA Management Plan, development of the National Forest land in the study area must comply with the Forestwide Standards and Guidelines contained in the MHNF Plan, where those standards enhance protection for identified scenic, cultural, and natural resources. In some cases (e.g., disturbance adjacent to intermittent streams or in riparian areas) the standards in the MHNF Plan are more restrictive and would apply to the design of the gateway facility, including trails.

**President's Plan.** The President's Plan designates the study area as Matrix with a Riparian Reserve overlay on riparian areas, including the 100-year floodplain.

Standards and guidelines for these designations apply, as well as the Aquatic Conservation Strategies in the ROD (see Section 1.1.2). A watershed analysis has been prepared and is included in the project analysis file. The goal of the watershed analysis is to determine whether the proposed action is consistent with applicable standards and guidelines. It is intended to document a scientifically based understanding of ecological structures, functions, processes and interactions occurring within a watershed.

**Floodplain Protection.** As discussed in Sections 3.2 and 3.3, the study area is a low-lying alluvial plain which is subject to periodic flooding. Figure 3.3-1 shows the areas of the site which have been determined by the FEMA to be located in the 100-year floodplain. The Flood Disaster Protection Act of 1973 (P.L. 93-234) and implementing regulations, the National Flood Insurance Program (44 CFR Parts 59-79) and Executive Order 11988 mandate that federal agencies protect the positive values of floodplains and avoid projects which would result in the negative alteration of the floodplain or increase flood hazard to properties up or downstream from the project site. Any grading proposed for the site must be evaluated to determine that it will not increase the flood hazard risk for adjacent properties, and any structures proposed for the site will have to be constructed on foundations which are at least one foot above the estimated 100-year flood elevation.

**Airport Noise Control and Land Use Compatibility.** A portion of the area proposed for gateway facility development is located in the runway clear zone designated in the Airport Master Plan for the Portland-Troutdale Airport (see Figure 3.6-2). In addition, the typical approach pattern for flights to and from the airport covers a larger portion of the site. Within the clear zone, there is an increased risk of accidents and increased noise. Frequent, low overflights of aircraft landing or taking off from airports produce noise which is a source of annoyance for some people. The basic approach to reducing these risks involves limiting the number of persons occupying the affected areas. Sensitive uses (hospitals, schools, residences, campgrounds) should not be located in these areas.

Habitat restoration within the study area may increase conflicts with airport operations if it results in a substantial increase in the numbers of birds using the Delta. Flocks of birds can be a hazard for small plane operations when they cross flight paths. Single birds, on the other hand, can more easily see and avoid aircraft. As waterfowl populations on the site are highest during winter months, conflicts are most likely to occur at that time.

**OPRD Columbia River Gorge District Master Plan.** OPRD's Columbia Gorge District Master Plan (1993) outlines planning for state parks in the Gorge. While general, the Master Plan does identify the need to consolidate the siting and design of FS facilities in the study area with overall transportation, parking and river access needs of Lewis and Clark State Park. In particular, OPRD is interested in relieving the current parking congestion along Jordan Road, developing additional designated public



river access facilities, and locating a public phone for emergency calls associated with river access and rock climbing accidents.

**Oregon Transportation Planning Rule.** In addition to these land use requirements, any changes to the I-84 alignment or the Jordan Road interchange must demonstrate compliance with the Oregon State Transportation Planning Administrative Rule. Safety improvements and interchange consolidation or replacement projects are permitted on rural lands (i.e., lands outside the urban growth area) under Section 660-12-065 of the Rule. Any proposed capacity expansion, including lane additions, new interchanges or major realignments to the interstate would require that an exception to the Rule be adopted by the County and approved by the Land Conservation and Development Commission.

### **3.7 RECREATION**

As discussed in the preceding section, the NSA Management Plan identifies the study area as a SMA, and designates a portion of the area as Public Recreation. The Recreation Development Plan, under the NSA Management Plan, identifies the function of a gateway facility at the Sandy River Delta as the "southwest orientation and information source". Currently, most visitors obtain information at Multnomah Falls or Crown Point. Neither of these sites are designed or intended to provide an overview of the NSA or to help direct visitors to locations in the NSA.

#### **3.7.1 NSA Management Plan/Recreation Development Plan**

A primary goal of the NSA Management Plan is to protect and enhance recreation opportunities, consistent with the sensitive resources of the Gorge. Only natural-resource-based recreation is permitted in the SMA. To implement this goal, the Management Plan identifies four Recreation Intensity Classes (RIC), which define the intensity of recreational development permitted in the Gorge. The study area includes three of the four classes -- RIC 1, RIC 2, and RIC 4. The Recreation Development Plan for the NSA provides more specific direction for the study area.

The following activities and experiences are consistent with the Recreation Development Plan for the site:

- Trails and trailheads;
- Parking areas;
- Dispersed campsites accessible only by trail;
- Viewpoints and overlooks;
- Picnic areas;
- Signs;

- Interpretive exhibits and displays;
- Restrooms;
- Gateway; and
- Wildlife/plant viewing.

The majority of the study area is designated RIC 1. Sites designated RIC 1 are intended for very low-intensity recreation uses, with a maximum capacity of 35 people at one time and parking for no more than 10 vehicles. Permitted uses are those which allow people to experience solitude, tension reduction, and nature appreciation.

RIC 2 designation is applied along the Sandy River, the confluence of the Sandy and Columbia Rivers, and a small area near Gary and Flag Islands near the existing boat dock. Sites designated RIC 2 are intended for low-intensity recreation, with a maximum design capacity of 70 people at one time and parking for no more than 25 cars. The emphasis is to provide semi-primitive recreation where people can participate in such activities and experiences as physical fitness, outdoor learning, relaxation, and escape from noise and crowds.

No vehicular access to campgrounds can be permitted in any RIC 2 areas on the project site because it would be necessary to cross open space to get to them (where no new roads are allowed) and/or the RIC 2 area is under water.

The area proposed for gateway development in all alternatives is designated RIC 4. This designation covers approximately 200 acres of the study area. The emphasis is on providing roaded, natural, rural, and suburban recreation opportunities with a high level of interaction in RIC 4. The gateway facility is intended to accommodate between 350 and 500 people at one time (PAOT). Under the NSA Management Plan, a maximum of 275 parking spaces may be provided. Multnomah County ordinances, which apply to non-federal lands, permit a maximum of 200 spaces. Permitted uses are those in which people can participate in activities to realize experiences such as socialization, cultural and natural history appreciation, and physical activity.

### **3.7.2 OPRD Columbia River Gorge District Master Plan**

Lewis and Clark State Park is managed to provide river recreation experiences, including boating and fishing. Facilities in the part support this use and a secondary use of Broughton Bluff by rock climbers. According to the Columbia River Gorge District Master Plan, OPRD has three primary objectives for the vicinity of Lewis and Clark State Park and the Sandy River Delta site:

1. Maintain the amount and improve the condition of parking for Lewis and Clark State Park.
2. Install a public phone at the paved Lewis and Clark parking lot.

3. Provide additional Sandy River access north of I-84.

### 3.7.3 Existing Recreation Uses

No developed recreation facilities exist in the Delta portion of the study area. However, informal recreation uses occur throughout this area, including fishing and boating on the Columbia and Sandy River shores, wildlife viewing and hunting, hiking, biking, horseback riding, swimming and dispersed camping. The majority of these uses are seasonal, with summer recreation use being the most significant. Fall uses are primarily shotgun hunting for waterfowl (geese, ducks, grouse) and rabbits, and bow hunting for deer. Weapons restrictions currently prohibit the use of other firearms on the site. Bass and salmon fishing picks up in the spring. Estimates or counts of existing usage levels are not available. The site is currently accessed for these uses via a network of approximately 8 miles of old farm roads and trails. Random recreation use is expected to increase as it becomes more widely known that the land is now in public ownership.

The scoping process and observation of existing activities indicate that the following activities are occurring on the site:

- hunting (predominantly waterfowl, although bow hunting for deer also occurs),
- fishing for salmon and steelhead in the Sandy and Columbia Rivers and for bass in the old channel;
- hiking;
- dispersed camping;
- mountain bike riding;
- horseback riding;
- exercising dogs; field trials;
- boating (including water skiing and jet boats);
- swimming/water play;
- collecting mushrooms and other special forest products;
- picnicking;
- birdwatching and wildlife observation; and
- photography.

A small moorage facility for boats is located between the Delta and Flag Island, east of the study area. This facility was built by the Oregon State Marine Board and is maintained by Multnomah County. The moorage receives extensive use during the summer and early fall, and boaters frequently go ashore on the Delta to hike and camp. The moorage has no sanitation facilities, and sanitation has become a problem on the Delta adjacent to the moorage as a result.

The Lewis and Clark State Park located south of I-84 and east of the Sandy River covers approximately 54 acres and includes a lawn area with trees, 41 picnic units, a restroom, a 125-

space paved parking lot, and a boat-ramp on the Sandy River. Broughton Bluff on the south side of the park is used for recreation climbing, and the Lower Elevation Gorge Trail is accessed near the bluff. Total day use attendance for FY 1991-1992 was recorded to be 268,448. Peak months were April through September, with August the highest at 35,092, or 7.65 percent of the total.

FS and law enforcement officials indicate that security is a growing concern -- both for facilities and visitors, in part due to a growing population of homeless people who camp illegally along the Sandy River. Most of the area has been open to camping for a maximum of 14 days, but has been used for longer periods in the past. That portion of the study area designated Public Recreation is not open for camping. In 1992, two stolen vehicles were recovered on-site and there were two reported incidents of illegal vehicles on the Delta. There were also two citations for illegal camps in the summer of 1992 and evidence of additional illegal camps. For this reason, the FS has recently closed the RIC 4 area to camping.

As shown in Table 3.7-1, parks in the vicinity of the study area (between the Sandy River Delta and Hood River) receive heavy recreational use. Visitor use at these regional sites near the proposed Sandy River Delta gateway site was estimated to total 5,894,530 in FY 1991-1992. The 1988-1993 Oregon Outdoor Recreation Plan indicates that "(t)he Portland metropolitan area shows significant disparities in supply for measured use in almost every activity." Metro projects that the population of the four-county Portland metropolitan area will increase by 1.1 million people by the year 2040. It predicts difficulty in meeting demand for recreation facilities and open space. With the expected increases in the population of the metropolitan area and out-of-state visitation, demand for recreation facilities will likely increase.

A recreation demand study for the NSA (Envirosphere Company, 1988) projects growth in public recreation in the NSA of approximately 0.9 percent per year through the year 2000. Total public recreational use of the NSA is currently about 14 to 15 million annual visits or use occasions. Sightseeing is by far the dominant recreational activity in the NSA, accounting for roughly 50 percent of total visits. The report states that, by both statistical measures and agency observations, the State Park campgrounds in the NSA are overutilized. Use at a number of popular FS sites, e.g., Multnomah Falls and Oneonta Gorge, also exceeds design capacity levels.

Parking for existing recreation demand in the study area is deficient. Parking is limited at Lewis and Clark State Park for peak summer uses. Parking often occurs along roadways in the area and on the interchange approach to I-84, even when space is available at the park because access to the river is better from these roads.



**TABLE 3.7-1  
RECREATION USE IN STUDY AREA VICINITY**

<i>PARK</i>	<i>ACRES</i>	<i>MAIN USES</i>	<i>1992 DAY USE ATTENDANCE</i>
Rooster Rock State Park	873	picnicking, boating, swimming, hiking	938,052
Benson State Park	271	picnicking, fishing, swimming	105,982
Bridal Veil Falls State Park	15	hiking, viewing	152,224
Crown Point State Park	307	viewing	1,028,848
Dabney State Park	135	picnicking, fishing	342,822
Guy Talbot State Park	46	picnicking, viewing, hiking	190,748
Ainsworth State Park		camping	18,678
Blue Lake Park (Multnomah County)	185	picnicking, hiking, swimming, boating	400,000
Oxbow Park (Multnomah County)	1,000	picnicking, fishing	250,000
Multnomah Falls (USFS)	2.4 (permit area)	viewing, hiking	1,800,000
Lewis and Clark State Park	54	picnicking, fishing	268,448
Approximate Total Visitation of these regional parks within 15 miles of site on east side of the Columbia River			5,495,802

*Source: Oregon State Parks and Recreation Department Use Data for FY 1991-1992*

### **3.8 SCENIC RESOURCES**

#### **3.8.1 Scenic Resources Management**

Primary direction for management of scenic resources on the site comes from the NSA Management Plan, and is based on landscape settings combining land use, landform and vegetation patterns. The NSA Management Plan provides design guidelines to protect and enhance scenic resources, which are described in Section 2.4.2.

Visual quality objectives (VQOs) are standards by which visual and aesthetic resources in the NSA are managed. They describe the degree of acceptable alteration of the natural landscape in terms of visual contrast with the surrounding natural landscape and are used to define long-term goals, acceptable standards, and conditions attained. There are five levels of VQOs including: preservation, retention, partial retention, modification, and maximum modification. See Glossary for definitions of each VQO. VQO are applied to landscape settings and land use designations.

### **3.8.2 Landscape Setting**

The study area west of the Sandy River (outside the NSA) is part of the Troutdale urban area and is dominated by intensive development, including a shopping mall, municipal airport, gas stations, truck stops, restaurants, and motels. The eastbound motorist on I-84 leaves the urbanized metropolitan area at the Sandy River and enters the more natural, undeveloped setting of the NSA.

The NSA Management Plan identifies the landscape setting of the study area inside the NSA as "River Bottomlands," where the overall character of floodplains and islands must be maintained. In these areas, structures should be screened or designed to blend with the natural setting. Existing BPA power transmission lines and towers do not meet this goal. The BPA easement must be kept clear of higher vegetation which could mask the view of the towers

The study area is a relatively flat floodplain with very little change in elevation, clearly defined by the Sandy and Columbia rivers and Broughton Bluff. Columbia River floodplain is a unique landform in the NSA, which is dominated by the steep Columbia River Gorge walls. The lowest levels are along the river shores and are about 20 feet lower than the inner portions of the site. Rock formations are not evident on the site itself. The soils and geology of the study area are described further in Section 3.2, Soils and Geology.

#### ***Vegetation***

The landscape in the study area has been altered in the past for cattle grazing. It is now a combination of deciduous forest and open meadows. The meadows and open water occupy approximately two-thirds of the area, allowing for penetrating views into the site. The native woods are primarily black cottonwood, red alder, bigleaf maple, white oak, and willow. Within Lewis and Clark State Park there are several non-native trees, including sweetgum (*Liquidambar styraciflua*), black locust (*Robinia pseudoacacia*), and pin oak (*Quercus palustris*). Most of these are within maintained turf areas. Non-native shrubs, including blackberry and Scot's broom, are found in the open areas. The banks of the Sandy River are vegetated with riparian species, primarily willows. See Section 3.4, Natural Resources for further description of the habitats and vegetation in the study area.

### *Waterform*

There are two miles of shoreline along the Sandy River on the western boundary of the study area, and 4-1/2 miles of shoreline along the Columbia River. Near the center of the Delta site there is an old channel of the Sandy River which fills during high water periods and retains small ponds when it drains. The Columbia River varies in width from 1/2 to 3/4-mile and does not have rapids or falls in the area. Three small islands (Gary, Flag, and Chatham) lie to the east of the site. The Sandy River is curving, with minor riffles and pools. It is of interest to anglers and may be of scenic interest to trail users as well.

### **3.8.3 Key Viewing Areas**

"Key viewing areas" are defined by the NSA Management Plan as portions of important public roads, parks, or other vantage points within the NSA from which the public views NSA landscapes. The key viewing areas relevant to the study area are: Crown Point, I-84, Washington State Route 14, the Columbia River, and the Sandy River. I-84 is also a designated Scenic Travel Corridor.

Other potential key viewing areas were investigated, including the HCRH, Portland Women's Forum State Park, and Larch Mountain. There are no public roads serving the Broughton Bluff area, hence it would not be a key viewing area of the study area. The Portland Women's Forum State Park is on the HCRH, 3/4-mile west of Crown Point. The viewpoint from this park is oriented to the east, up the Columbia River. The study area is not visible due to dense tree stands to the west. The HCRH does not provide views of the study area, other than at Crown Point. The study area is visible from Larch Mountain, 13 miles to the east. However, the study area is only a small part of the larger landscape scene and therefore Larch Mountain is not considered a key viewing area relevant to this site.

Views from the key viewing areas have been evaluated as they relate to the study area. For the purposes of the evaluation, Crown Point, Washington Route 14, and the Columbia River are considered to be "external viewpoints", and I-84 and the Sandy River are considered to be "internal viewpoints". Representative viewpoints are numbered and shown on Figure 3.8-1 and described in Table 3.8-1.

In addition to the key viewing area viewpoints, additional external and internal viewpoints of the study area were evaluated and described in a technical memorandum. These additional viewpoints were selected since they are representative of views within the study area, or show distinctive visual features on the site.

Photographs from the key viewing areas are presented in Figures 3.8-2 through 3.8-5, and are keyed to the viewpoint numbers in Figure 3.8-1 and Table 3.8-1.



# SANDY RIVER DELTA

## Columbia River Gorge National Scenic Area

### PHOTO VIEWPOINTS

COLUMBIA RIVER GORGE  
NATIONAL SCENIC AREA BOUNDARY

#### LEGEND

- EXTERNAL VIEWPOINTS
- INTERNAL VIEWPOINTS

STUDY AREA

REED ISLAND

COLUMBIA

RIVER

WASHINGTON

OREGON

CLATSOP

WASHINGTON

CLATSOP

CLATSOP

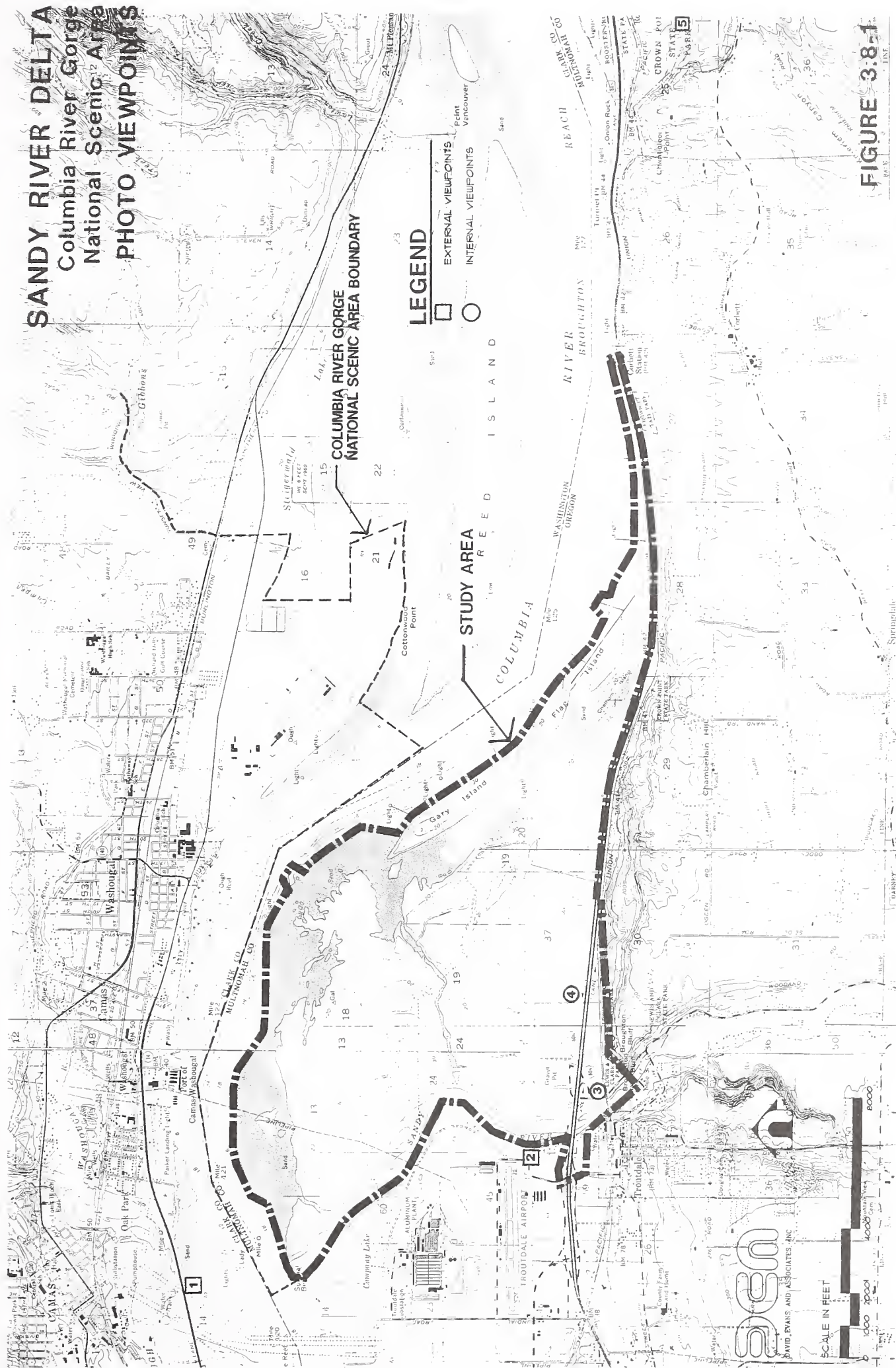
CLATSOP

CLATSOP

FIGURE 3.8-1

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SCALE IN FEET









View of the Sandy Delta and Broughton Bluff from across the Columbia River in Washington

**FIGURE 3.8 - 2**  
**RESPRESENTATIVE VIEWS**  
**SANDY RIVER DELTA PLAN**  
Columbia River Gorge National Scenic Area





View from I-84 bridge north of Sandy Delta

**FIGURE 3.8 - 3**  
**RESPRESENTATIVE VIEWS**  
**SANDY RIVER DELTA PLAN**  
Columbia River Gorge National Scenic Area







Looking west at the Sandy Delta from I-84

**FIGURE 3.8 - 4**  
**RESPRESENTATIVE VIEWS**  
**SANDY RIVER DELTA PLAN**  
Columbia River Gorge National Scenic Area





View from Lewis and Clark Park north along Sandy River.



View from Crown Point east. Sandy Delta is in center.





**TABLE 3.8-1  
VIEWPOINTS DESCRIPTION**

<i>VIEWPOINTS</i>	<i>DESCRIPTION</i>	<i>VQO RATING</i>
Columbia River External Viewpoint (1)	Boat dock on the river offers view of site that is similar to view from boats on the Columbia River. Scene is dominated by the river and the hills south of the river. The landform of the site is weak, but the tree cover provides a natural appearing shoreline; only negative aspect is a power line tower, visible against the hills in the middle ground.	Partial Retention
Sandy River External Viewpoint (2)	Viewpoint selected because it is on a public road which serves a few residences along the Sandy River, and it is higher than the river itself, providing a good overview of the river and the site. It also helps represent views of the site from the river. View is dominated by the river, the rocky beach, and the trees along the shoreline; landform is weak except for Broughton Bluff in distance. Only negative elements are two power line towers visible to the north; they are partly screened and do not dominate the scene.	Retention
Lewis and Clark Internal Viewpoint (3)	Looking northeast at the I-84/Sandy River bridge. View is dominated by the river and bridge.	Partial Retention
I-84 Internal Viewpoint (4)	Looking eastward, scene is dominated by the flat, broad meadow with riparian vegetation in the background. Landform is weak. I-84 and traffic signs are visible.	Retention
Crown Point, External Viewpoint (5)	Site is visible at a distance of five miles. Scene is dominated by the Columbia River and Reed Island. River turns northward at the site, but there are no significant landscape features which might attract attention; main feature is the tree cover. Old Sandy River channel is visible, along with a sandy shoreline; large open meadows are barely evident. The BPA power line is not readily apparent.	Retention

\* Designated by NSA Management Plan as "Key Viewing Area" VQO = Visual Quality Objective

### **3.9 TRANSPORTATION**

The NSA Management Plan SMA goal is to provide for transportation facilities to meet the needs of the travelling public and to implement the recreation development plan and land use designations while protecting scenic, cultural, recreation, and natural resources. Jordan Road and the Jordan Road interchange were built to older standards for rural, low volume roads. In addition, the interchange is too close to the Troutdale interchange. Increased traffic resulting from any development of the site could exacerbate safety problems.

#### **3.9.1 Existing Road System**

##### ***Jordan Road***

The project study area is currently accessed from Jordan Road, which is the Exit 18 interchange both east and westbound along Interstate 84 (see further discussion of interchange below). Jordan Road, which is a State (ODOT) facility, ends on the north side of this

interchange, tying into the westbound on- and off-ramps of I-84. There is a fenced gate at the north end of the on- and off-ramps, which provides access to a private gravel road serving the Delta subarea. The gravel road cuts north across the property almost to the center of Sun Dial Island, then it turns west and ends at the Sandy River banks. This road was established when the site was being farmed and now serves to provide access to the study area for BPA and NWPC maintenance activities, as well as for security, law enforcement and emergency access by the FS and cooperating agencies.

Jordan Road runs along the east side of the Sandy River, between I-84 on the north and the HCRH on the south. In the vicinity of the study area, the road is a two-lane facility with 10- to 12-foot travel lanes and 2-foot shoulders. The road passes under I-84 (one underpass for each direction of I-84) and the UPRR south of I-84. The two Jordan Road underpasses of I-84 have a pavement width of 24 feet, with only a one-foot clearance between the curb and bridge abutment on each side of the road. At the railroad underpass, Jordan Road has a restricted pavement width of 20 feet (on the south side of the underpass) with a five-foot shoulder on the west side of the road. The railroad underpass has a vertical clearance of only 13 feet-10 inches in the southbound direction and 14 feet-8 inches in the northbound direction.

There is no signed speed limit for Jordan Road in the vicinity of the study area; there are 20 miles per hour (mph) warning signs for the curve north of the I-84 underpasses and 15 mph warning signs for the curve south of the railroad underpass.

Jordan Road provides access to the parking lots for Lewis and Clark State Park (located south of the railroad). Therefore, access to the park occurs via I-84 to Jordan Road or the HCRH to Jordan Road.

### ***Interstate 84/Jordan Road Interchange***

I-84 is an interstate freeway providing connections between Portland and Idaho and points east. Through the study area, as well as throughout the Gorge, I-84 has two lanes in each direction. The Exit 18/Jordan Road interchange just east of the Sandy River provides direct access off I-84 to the study area. This interchange was originally built in 1960, as part of the initial freeway construction in the area.

The interchange is a folded diamond configuration, with all ramps located on the east side of the Jordan Road overpass due to the constraint of the Sandy River to the west. Eastbound traffic exiting I-84 uses a loop ramp in the southeast quadrant of the interchange, which connects with Jordan Road south of the overpass structure at an unsignalized intersection, with the ramp approach under stop sign control. This intersection is also used by traffic turning from Jordan Road eastbound onto I-84, using a diamond ramp, a portion of which is shared with the off-ramp as a two-way roadway.

Traffic from Jordan Road accessing westbound I-84 must travel under I-84 and use a loop ramp at the end of the road next to the delta property access road. Westbound traffic exiting

# SANDY RIVER DELTA

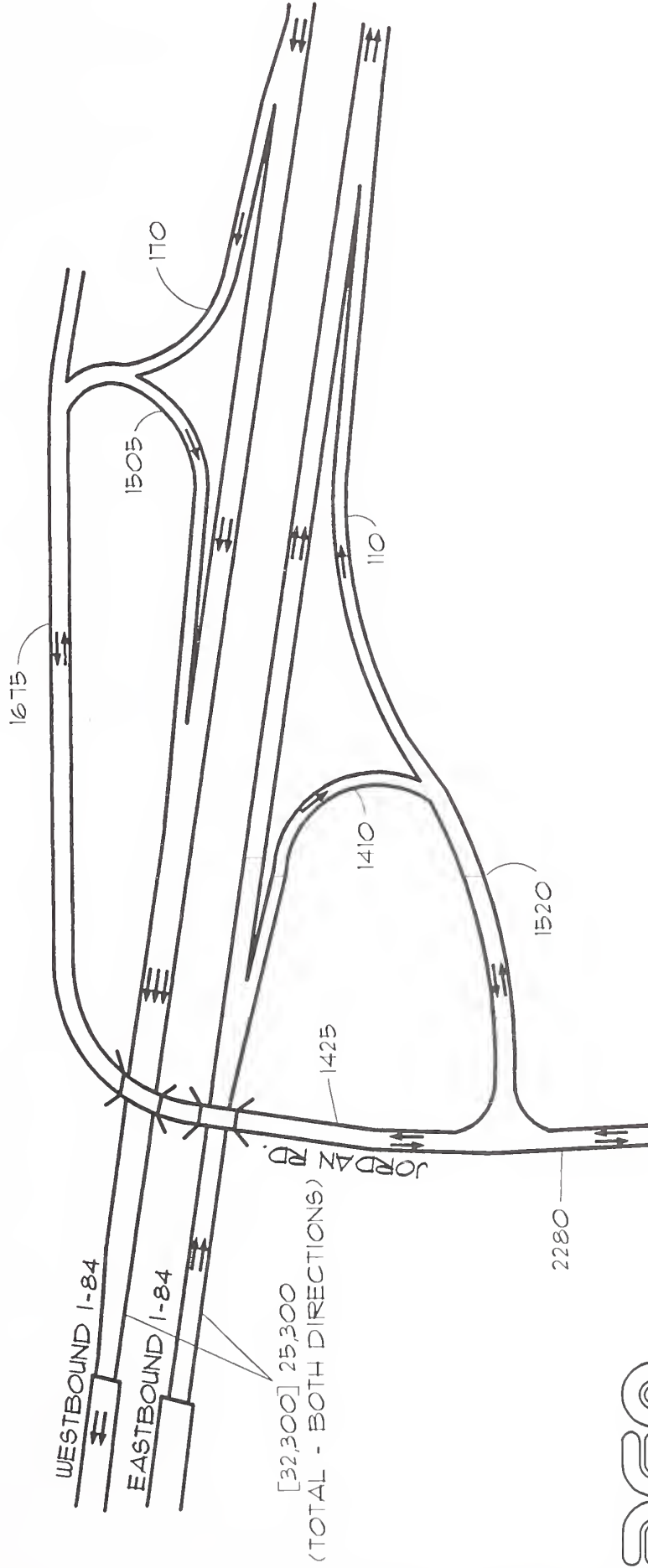
## Columbia River Gorge National Scenic Area

### LEGEND:

25,300 - WEEKDAY TRAFFIC VOLUME  
(MAY 1992 FOR RAMP,  
MAY 1991 FOR I-84 MAINLINE)

[32,300] - PEAK SUMMER WEEKDAY VOLUME - AUGUST 1991

[32,300] - PEAK SUMMER WEEKDAY VOLUME - AUGUST 1991



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FIGURE 3.9-1

CURRENT TRAFFIC VOLUMES  
I-84/ JORDAN ROAD INTERCHANGE





I-84 uses a diamond ramp which connects with the end of Jordan Road. The interchange ramps do not meet current design standards for turning radius, sight distance, length of merge lane, and access control. The westbound loop on-ramp is signed for a speed of only 15 mph, while the eastbound loop off-ramp is signed for 25 mph. The westbound diamond off-ramp is signed for a speed of 25 mph.

About a half mile west of the Jordan Road interchange, across the Sandy River, access to/from I-84 is provided at Exit 17, a split diamond interchange with connections to Graham Road and Marine Drive in Troutdale, referred to as the "Troutdale interchange". This interchange provides freeway access to the City of Troutdale and the Port of Portland/Troutdale Airport. Both frontage roads for the split diamond provide for two-way traffic.

### ***Historic Columbia River Highway***

The HCRH is accessible from Jordan Road and connects several scenic attractions and recreational areas on the south side of the Columbia River, including Crown Point, Portland Women's Forum State Park, Dabney State Park, and Oxbow County Park, via the Stark Street Bridge. The HCRH crosses the Sandy River approximately one mile south of the Jordan Road interchange. It then follows the approximate course of the Sandy River for about eight miles before turning back toward the east. The main/marked exit for the HCRH, however, is Exit 16B, located west of the Jordan Road interchange and most associated traffic exits before the Jordan Road exit.

### ***Traffic Volumes***

Figure 3.9-1 identifies the daily traffic volumes on the ramps at the I-84/Jordan Road interchange and on Jordan Road for a typical weekday in May, 1992. Weekday traffic volumes on the I-84 mainline west of the interchange in both May and August (peak traffic months) 1991 are also presented. These traffic volumes were developed from ODOT counts, including data from the permanent count station on I-84 just west of the Sandy River.

Just south of I-84, Jordan Road had a weekday traffic volume of about 2,300 vehicles in May, 1992. I-84 west of Jordan Road had a traffic volume of about 25,000 vehicles a day on an average weekday in May, 1991, with a high volume of about 34,600 vehicles a day on a weekend day in the peak summer month (August). The highest weekday traffic volumes on the interchange ramps in May, 1992 were on the westbound on-ramp and the eastbound off-ramp (each with about 1,500 vehicles a day). This reflects a higher trip orientation to and from the Portland metro area from Jordan Road. According to OPRD, Lewis and Clark State Park generates about 270,000 vehicle trips a year (two-way).

Trucks entering the freeway eastbound from Troutdale comprise approximately 17% of the average weekday ramp volume. The eastbound on ramp does not provide sufficient acceleration length for trucks to enter the outside (right) freeway lane at highway speeds. As a result, the high volume, slow speed truck movements at times will force auto traffic into the

inside (left) lane. For vehicles desiring to exit at Jordan Road, the short (one-half mile) distance between interchanges requires a quick weaving maneuver into the right lane prior to the exit ramp.

### *Level of Service*

Level of Service (LOS) is a qualitative measure describing traffic operations conditions and their perception by motorists. An LOS definition describes these conditions in terms of variables such as travel time and speed, freedom to maneuver, comfort and convenience, and safety. Six levels of service have been defined. They have been given letter designations from A to F, with LOS A representing the best operating conditions (free flow) and F representing the worst operating conditions (over capacity, stop-and-go). See LOS chart in Appendix H.

The level of service on the I-84/Jordan Road interchange ramps for the peak summer weekday traffic volume condition was estimated for AM and PM peak hour conditions. Traffic volume assumptions for this analysis were derived by increasing the May 1992 interchange ramp traffic counts to the peak month condition during August, based on the percentage increase in traffic between May and August, 1991 on the I-84 mainline. The analysis revealed that the interchange operates at a high LOS during these periods ("A" or "B"). In the case of low volume roads with safety problems, the LOS may not reflect existing conditions accurately.

### **3.9.2 Parking**

The only developed parking facility within the study area is at Lewis and Clark State Park, on the east side of Jordan Road south of the railroad. This parking lot has 125 marked spaces, including two handicap spaces. OPRD owns another parcel on the east side of Jordan Road just north of the UPRR that can be used as a parking area during peak season. This area accommodates approximately 150 vehicles.

Vehicles also park in the unpaved area on the east side of Jordan Road south of the interchange and along the shoulder of Jordan Road on the north side of the interchange. This parking is mostly associated with users of the Sandy River and Delta (usually hikers and anglers).

As discussed in Chapter 1, NSA guidelines for RIC 4 land allow a maximum design capacity for parking for each facility of 250 vehicles. However, 275 parking spaces can be allowed if enhancement or mitigation measures for scenic, cultural, or natural resources are approved for at least 20 percent of the site. Developments/improvement within the same recreation intensity class are considered separate facilities if they are separated by at least 0.25 mile of undeveloped land (excluding trails, pathways, or access roads). If the gateway facility is located on non-federal land within 0.25 miles of Lewis and Clark State Park, Multnomah County ordinances implementing the NSA Management Plan allow a maximum of 200 parking spaces to be developed for both facilities combined.

### **3.9.3 Planned Transportation System Improvements**

As discussed in Chapter 1.0, the design of I-84/Jordan Road interchange modification is being addressed in this EIS. However, this project is not identified in ODOT's current Six-Year Highway Improvement Program. The interchange at one time was to be included in ODOT's 181st-Troutdale improvement project (reconstructing the freeway to six lanes with interchange improvements), but the Exit 18 interchange was removed from the project corridor because of uncertainty over NSA requirements, as the NSA Management Plan had not yet been completed.

### **3.9.4 Bicycle and Pedestrian Facilities**

There are no sidewalks, pedestrian trails, or bike lanes along Jordan Road within the study area. The limited width of Jordan Road through the two I-84 underpasses, with the absence of shoulders or sidewalks, poses a major constraint for pedestrian access between parked vehicles on the south side of the interchange and the Delta property. This is one reason why many vehicles park along the shoulder of Jordan Road on the north of the interchange.

The existing trail system within the project area north of I-84 is a network of farm roads and footpaths that have developed from informal use for fishing, hunting, and hiking. An unpaved road provides access to Sun Dial Island across the historic dam. There is also a farm road along the north side of the Thousand Acres area, south of the old Sandy channel.

The Lower Elevation Gorge Trail connects from the east to Lewis and Clark State Park at the base of Broughton Bluff.

### **3.9.5 Rail System**

The UPRR bisects the portion of the study area south of I-84. The railroad was constructed in 1882. Approximately 20 trains pass through the project area daily. At least one train each day is an Amtrack passenger train bound for, or returning from, Chicago, Illinois. The remainder of the train traffic is freight (including agricultural products, electronics, timber, automobiles, bulk petroleum products, etc.).

### **3.9.6 Bus Services**

Several charter bus companies (including Gray Line, Northwest Tours, and RAZ) run tour bus services from the Portland area to the Columbia River Gorge and Hood River along I-84, passing through the Sandy River Delta Study area. The charter bus services originate mostly in Portland and Vancouver, Washington. On the average, up to six charter buses operate into the Gorge on a daily basis. On peak days a total of over 20 charter buses may operate in the area.



Commercial use of the study area for charter bus operations is not permitted under the NSA Management Plan Guidelines, other than stopping to visit the site.

The NSA Management Plan states that accommodation of facilities for mass transportation (bus parking) shall be required for all new high-intensity (RIC 3 or 4) day use recreation sites, except for sites predominantly devoted to boat access.

### **3.10 AIR QUALITY**

This section addresses the existing air quality conditions in the vicinity of the study area that could be affected by the proposed action. These conditions are primarily influenced by air pollutants generated by motor vehicles and industries in the Portland-Vancouver Air Quality Maintenance Area (Portland-Vancouver AQMA). The existing air quality of the Portland-Vancouver AQMA, as well as the existing air quality conditions at the site will be described in this section. Air quality standards and air quality plans and regulations applicable to the study area will be addressed first, followed by the results of air quality modeling conducted for locations in and near the study area.

#### **3.10.1 Air Quality Standards**

Air quality conditions are evaluated based on whether or not, and how often, air quality standards are exceeded. National Ambient Air Quality Standards (NAAQS) are established by the 1963 Clean Air Act and subsequent amendments, including 1990 amendments, to protect the public health (primary standards) and public welfare (secondary standards) from any known or anticipated adverse effects associated with the presence of pollutants in the ambient air. The 1963 Clean Air Act identifies seven major types of ambient air pollution: carbon monoxide (CO), ozone, volatile organic compounds (VOC), oxides of nitrogen (NO<sub>x</sub>), total suspended particulates (TSP); sulfur dioxide (SO<sub>2</sub>), and lead (Pb). The Clean Air Act and Amendments (CAAA) also establish emission standards for stationary emission sources. Enforcement of the CAAA in Oregon has been delegated by the U.S. Environmental Protection Agency (EPA) to the DEQ. DEQ, in turn, is required to develop and administer air pollution prevention and control programs approved by EPA. State ambient air standards must either be the same as or more stringent than the federal NAAQS. Applicable outdoor or "ambient" air quality standards are displayed in Table 3.10-1. State and federal ambient standards are identical.

#### **3.10.2 Existing Air Quality in the Portland AQMA**

Emission sources in the Portland-Vancouver AQMA influence air quality at the site. Geographic areas where concentrations of a particular pollutant exceed the NAAQS are classified as non-attainment areas. In 1981, the Portland-Vancouver AQMA was found to be a non-attainment area for CO and ozone, and not in compliance with the secondary standard

for TSP. The designation of the region as a non-attainment area does not mean that the entire area exceeds carbon monoxide and ozone standards. Rather, it is a reflection of the fact that vehicles from the entire metropolitan area are contributing to high concentrations at specific locations in the region.

Portland exceeded the ozone standard on four days in 1990, and on one day in 1991 and 1992. CO levels in the Portland-Vancouver AQMA in 1992 declined over those in 1991 and there were no exceedences of the CO standard. These levels are expected to continue to decline due to more stringent automobile emission standards enacted by EPA that go into effect this year. Beginning in November, 1992, Portland began an "oxy-fuels program", requiring gas stations to provide gasoline specially formulated to cut down on CO emissions. Other CO control strategies include an inspection and maintenance program and a downtown parking and circulation plan.

**TABLE 3.10-1  
FEDERAL AND STATE AMBIENT AIR QUALITY STANDARDS**

<i>POLLUTANT</i>	<i>SAMPLING PERIOD</i>	<i>FEDERAL STANDARD</i>	<i>STATE STANDARD</i>
Inhalable Particulate Matter (PM <sub>10</sub> )	Annual Arithmetic Mean ( $\mu\text{g}/\text{m}^3$ )	50	50
	24-hour Average ( $\mu\text{g}/\text{m}^3$ )	150	150
Total Suspended Particulate Matter (TSP)	Annual Geometric Mean ( $\mu\text{g}/\text{m}^3$ )	NA	60
	24-hour Average ( $\mu\text{g}/\text{m}^3$ )	NA	150
Sulfur Dioxide (SO <sub>2</sub> )	Annual Average (ppm)	0.03	0.02
	24-hour Average (ppm)	0.14	0.10
	3-hour Average (ppm)	0.5	0.5
Carbon Monoxide (CO)	8-hour Average (ppm)	9	9
	1-hour Average (ppm)	35	35
Ozone (O <sub>3</sub> )	1-hour Average (ppm)	0.12	0.12
Nitrogen Dioxide (NO <sub>2</sub> )	Annual Average (ppm)	0.053	0.053
Lead (Pb)	Quarterly Average ( $\mu\text{g}/\text{m}^3$ )	1.5	1.5

$\mu\text{g}/\text{m}^3$  = micrograms per cubic meter

ppm = parts per million

### **3.10.3 Air Quality Plans and Regulations**

Any proposed federal activity in or near the non-attainment area must demonstrate conformity to the Portland-Vancouver AQMA State Implementation Plan (SIP). Section 176(c) of the Clean Air Act provides the guidelines for conformity and states that no new activity shall be approved by a federal agency if conformity to a SIP cannot be demonstrated. This includes actions on federal lands outside the non-attainment area that may affect SIP conformance. EPA adopted final regulations to implement the Clean Air Act conformity provisions on November 30, 1993 (EPA, 1993a). The provisions of these regulations became effective January 31, 1994.

DEQ regulates new emission sources through Indirect Source Construction Permits and Indirect Source Contamination Permits for all projects large enough to have a potentially significant effect upon air quality. Projects that must be reviewed for these permits include construction or expansion of new or additional parking of 500 spaces or more and highway construction or modification that results in average daily traffic of 20,000 or more motor vehicles per day within ten years after completion. Since none of the alternatives would meet or exceed these thresholds, indirect source permits would not be required for the project.

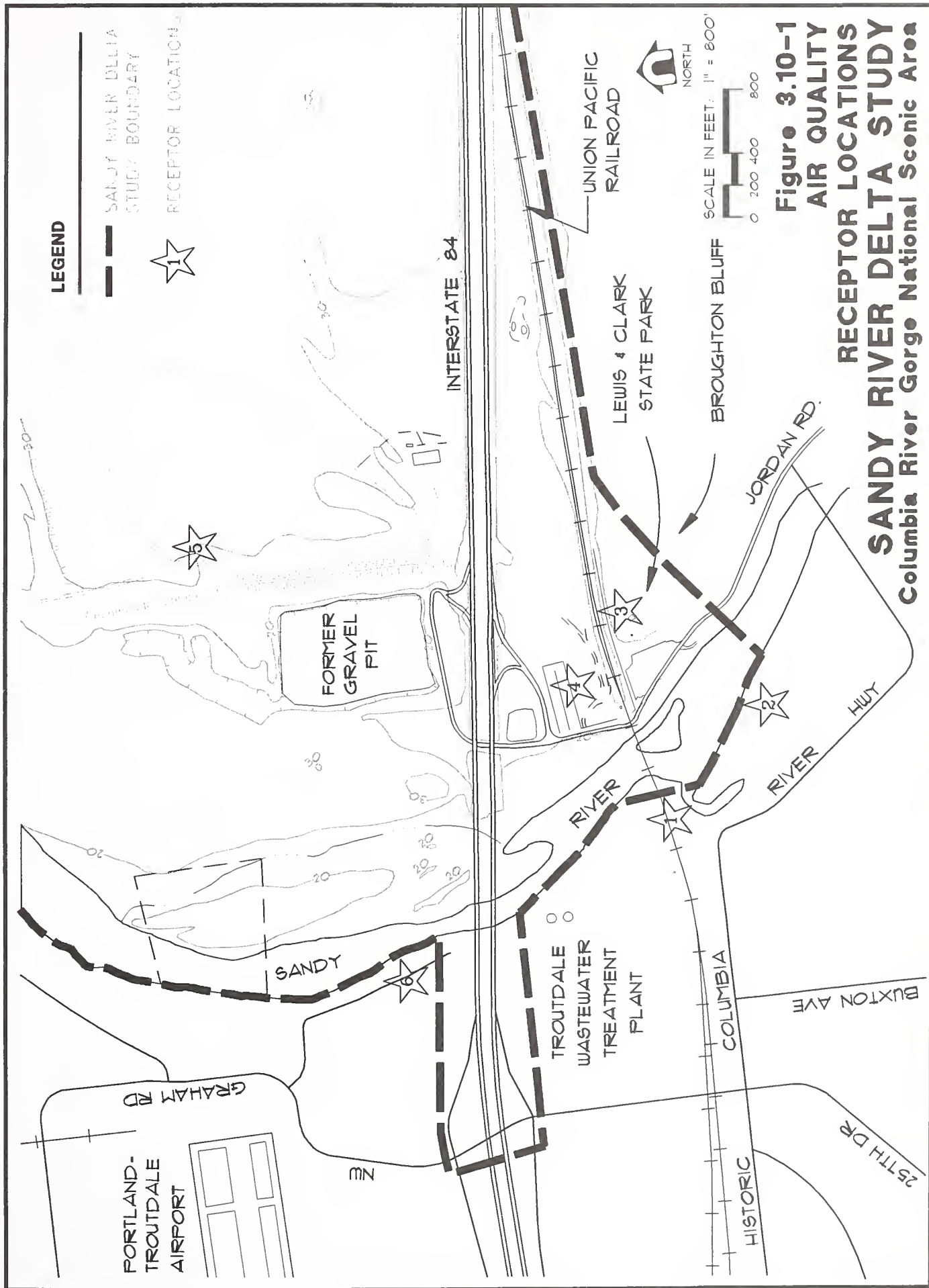
### **3.10.4 Existing Air Quality at the Project Study Area**

Although there are several ambient air quality monitoring stations in the Portland-Vancouver AQMA, none are in the vicinity of the study area. Data from the nearest stations show a general downward trend in CO levels.

Ozone data is not available for the study area. However, average ozone levels have been increasing in the Portland-Vancouver AQMA since reaching a low point in 1983.

The study area is located within a marginal CO non-attainment area but outside of the ozone non-attainment area. CO is used as an indicator of air quality in this analysis. CO usually is the pollutant of greatest concern related to transportation sources because it is emitted in the greatest quantity and has short-term health standards.

For this analysis of air quality in the study area, six sites were selected as "receptors." These sites are described below and displayed in Figure 3.10-1. Receptor locations 1, 2 and 6 are located west of Sandy River and are therefore in the Portland AQMA and in the ozone non-attainment area. The remaining three receptor locations are outside the AQMA and ozone non-attainment area, but still inside the CO non-attainment area. These receptor locations were selected because they represented existing or possible future areas of recreational or gateway activities in and near the study area (Receptors 1 and 3-5), or a close residential property (Receptors 2 and 6).







- Receptor 1: Site 1 is located in the park and picnic area of the railroad museum in Troutdale, just off of the HCRH and next to the Sandy River.
- Receptor 2: This location is in the backyard of a house located south of Troutdale's rail museum next to the HCRH.
- Receptor 3: This receptor is located in the picnic area of Lewis and Clark State Park.
- Receptor 4: This site is located in the ODOT Triangle just south of I-84's eastbound off-ramp at the Jordan Road interchange. This would be the approximate location of the gateway facility/picnic area in Alternative 3 and the information kiosk/picnic area in Alternative 4.
- Receptor 5: Site 5 is located in the Delta subarea at the approximate location of the gateway facility in Alternative 2 and the restoration center/caretaker's residence in Alternative 3.
- Receptor 6: Site 6 is located north of I-84 and west of the Sandy River in an area of single-family homes along the river across from the site.

CO emission rates were estimated using the U.S. Environmental Protection Agency's Mobile 5A model (U.S. EPA 1993). Mobile 5A accounts for the gradual replacement of older technology vehicles with vehicles with less polluting engines due to federal mandates. Other critical assumptions made in the analysis are consistent with those of the Portland Transportation Improvement Program (TIP).

The Caline 3 model (Benson, 1979) was used to calculate peak hour CO concentrations at the five receptor locations. Regulatory agencies recommend that impact analyses focus on the eight-hour average concentration (versus one-hour or peak-hour) because it is usually the controlling or limiting air quality standard for traffic-related air pollution. Eight-hour average concentrations are lower than peak-hour values because the average traffic volume is lower and because the meteorological conditions usually change over an eight-hour period.

Based upon modeling, CO concentrations in the study area are presently about ten percent of the 1-hour CO standard of 35 ppm and well below the 8-hour average standard of 9 ppm. Concentrations range from 3.3 ppm at receptors 2 and 5 to 3.8 ppm at receptor 4.

Mobile 5A accounts for the gradual replacement of older technology vehicles with vehicles with less polluting engines due to federal mandates. Other critical assumptions made in the analysis are consistent with those of the Portland Transportation Improvement Program (TIP).

### **3.11 NOISE**

In addition to the air pollutants described in Section 3.10, noise is also a pollutant that is transferred through the air. Noise has often been treated as merely a nuisance. However, many studies have now shown that noise has a definite effect on public health and welfare. Exposure to loud noises can result in hearing loss or tinnitus (a high-pitched ringing or roaring in the ears).

Average sound levels are provided by a noise descriptor known as the equivalent sound level (Leq). The equivalent sound level is the level of a constant sound with the same energy as the actual fluctuating sound. When considering Leq, it is important to identify the time interval. Leq(1), for example, is the equivalent sound level for a 1-hour period. Unless otherwise noted, all values discussed in this section are 1-hour Leqs.

The human ear responds to a very wide range of sound intensities. The decibel (dB) scale used to describe sound is a logarithmic rating system which accounts for the large differences in audible sound levels. This scale accounts for the human perception of a doubling of loudness as an increase of 10 dB. Therefore, a 70 dB sound level will be perceived as twice as loud as a 60 dB sound level. People generally cannot detect differences of one dB; a five dB change is a noticeable change in noise levels under normal listening conditions. Sound levels associated with a range of common noise sources are shown in Table 3.11-1. Distance from the source, the frequency of the sound, the absorptency of the intervening ground, obstructions, and duration all affect the transmission and perception of noise.

Noise criteria are often dependent on land uses within and adjacent to a project area. Land uses within the study area consist mostly of recreational uses and undeveloped land. Being geared toward recreational activity, the project area experiences the heaviest use during midday hours. Adjacent land uses (across Sandy River) include residential, commercial and industrial developments. For the project area, 67 dBA is the applicable maximum noise level.

### **3.11.1 Existing Acoustic Environment**

Sound level measurements are useful for quantifying the existing acoustic environment and for characterizing the noise source(s) and the local terrain features likely to affect noise propagation. The existing noise levels displayed in Table 3.11-2 were measured at six locations identical to the air quality receptor sites described in the preceding section on air quality. Background noise from traffic on I-84 is audible at all sound level measurement (SLM) locations in the project area.

The measured noise levels vary from 48-58 dBA. Site 2 is representative of residential receptors located near the study area. However, this site is also one of the closest of all the residences to I-84. For the purpose of this analysis, sites 1 and 3 are considered sensitive receptors because they are existing picnic and outdoor recreational areas. Site 4 is the approximate location of the proposed gateway facility and picnic area in Alternative 3 and an information kiosk and picnic area under Alternative 4. Site 5 is the approximate location of

the proposed gateway center in Alternative 2, and the restoration center/caretaker's residence in Alternative 3. Site 6 is across the Sandy River from the Delta in an area of single-family homes along the river.

**TABLE 3.11-1**  
**SOUND LEVELS PRODUCED BY COMMON NOISE SOURCES**

<i>THRESHOLDS/NOISE SOURCES</i>	<i>SOUND LEVEL (dBA)</i>	<i>SUBJECTIVE EVALUATIONS</i>	<i>POSSIBLE EFFECTS ON HUMANS</i>
Human Threshold of Pain	140	Deafening	Continuous exposure can cause hearing loss
Carrier jet takeoff (50 ft)			
Siren (100 ft)	130		
Loud rock band			
Jet takeoff (200 ft)	120		
Chain saw	110		
Lawn mower (3 ft)	100	Very	
Noisy motorcycle (50 ft)			
Heavy truck (50 ft)	90	Loud	
Busy urban street, daytime	80		
Normal automobile at 50 mph	70	Loud	Speech
Vacuum cleaner (3 ft)			
Large air conditioning unit (20 ft)	60	Moderate	Interference
Conversation (3 ft)			
Quiet residential area	50		Sleep
Light auto traffic (100 ft)			
Library	40	Faint	Interference
Soft whisper (15 ft)	30		
Broadcasting Studio	10	Very	
Threshold of Human Hearing	0	Faint	



**TABLE 3.11-2  
NOISE MEASUREMENT DATA**

<i>MEASUREMENT SITE</i>	<i>TIME</i>	<i>DISTANCE FROM CENTER OF ROAD IN METERS (ft)</i>	<i>MEASURED LEQ LEVEL (dBA)</i>	<i>CALC. LEQ LEVEL (dBA)</i>
SLM1	10:30 am	343 (1125)	55	56
SLM2	11:02 am	501 (1644)	55	54
SLM3	12:35 pm	263 (863)	57	56
SLM4*	1:30 pm	162 (531)	58	58
SLM5	2:45 pm	516 (1694)	48	47
SLM6				

\* A peak-traffic hour sound level measurement (SLM) was taken at this location in addition to the midday measurement. Like the midday reading, the sound level was 58 dBA.

Traffic on I-84 dominates the sound environment and measured sound levels at all receptor locations. Other audible noises include aircraft noise (most was excluded from the measurements by pausing the sound level meter), railroad noise, birds, river noise, voices, rustling trees and insects. Measures were taken to eliminate as much airplane and railroad noise as possible from the sound level measurements in order to discern traffic-only noise levels. However, the Portland-Troutdale Airport had enough activity that it was difficult to obtain a reading without some amount of airplane noise. Calculated noise levels showed that the computer program adequately models the traffic and related noise and can be used to model future traffic noise levels without adjustments.

Plane flyovers generate loud, intermittent noise peaks throughout the study area because the planes are not limited to east-west directional flying when they are east of the Sandy River. The Portland-Troutdale Airport has an average of 300 operations (takeoffs and landings) per day.

Trains operate less frequently through the site (an average of 20 pass-bys per day). Therefore, trains generate high noise levels intermittently several times a day. It is most noticeable in Lewis and Clark State Park and the ODOT Triangle portions of the study area.

### **3.12 UTILITIES AND SERVICES**

The NSA Recreation Development Plan states that provision of emergency, law enforcement, and fire services is a major concern for the Sandy River Delta site.

Currently, the Delta subarea has telephone, electricity, and possibly drinking water from a spring on Broughton Bluff, but no public sewage treatment or natural gas services. The facilities at Lewis and Clark State Park are on a well and septic system. There are telephone (Pacific Northwest Bell) and electrical lines (Portland General Electric) adjacent to the project area. Water is available from a spring on Broughton Bluff and is piped under the highway to the Delta area, however, the potential quantity from this source is uncertain. A search of WRD records indicates no recorded water rights for this source. This water was tested in December, 1992 and found to be potable.

The nearest public sanitary sewer service is located in the City of Troutdale. There is a 12-inch diameter PVC collector to the Portland-Troutdale Airport and Reynolds Aluminum plant west of the project area. This line has a stub at I-84 which could be extended east across the Sandy River to the study area. Troutdale has extended sanitary sewer service across the Sandy River on the HCRH bridge to serve Tad's Chicken and Dumplings Restaurant. This is a 4-inch diameter step-system, with sewage pumped in steps up to the level of the treatment plant.

The nearest public water supply is the City of Troutdale's water lines which serve the airport and Reynolds plant. These are 10-inch and 12-inch lines, respectively.

Telephone service is not currently available in the project area. This affects response time in the event of emergencies on the Delta and at Lewis and Clark State Park.

BPA has two parallel power line right-of-way easements across the Delta subarea. These easements are 400 feet wide and include 23 towers supporting high voltage transmission lines. Vegetation is kept short and recreational use is discouraged under the lines.

The nearest natural gas service is also located in the City of Troutdale. It is provided by Northwest Natural Gas. Northwest Pacific Power Company (NWPC) has an easement across the northern portion of the Delta for a high-pressure natural gas transmission line. The line is buried 36 inches deep. NWPC also maintains herbaceous vegetation within the easement to facilitate routine monitoring of the pipeline.

Although the study area is located mostly in unincorporated Multnomah County, the majority of the site is federal land and primary responsibility for law enforcement and fire protection belongs to the FS. The NSA office in Hood River patrols the Delta to enforce federal regulations. The FS has cooperative agreements with Multnomah County Sheriff's Office, Oregon State Police and the City of Troutdale to provide back-up in the event of an emergency. The Sheriff's office also patrols the Delta during the summer high-use season. The ODOT Triangle is within the service area of the Sheriff's Office, and I-84 and Jordan Road are patrolled by the Oregon State Police. ODFW enforces fish and game laws on both federal and state lands.

Fire and police protection for Lewis and Clark State Park is under the jurisdiction of OPRD. Fire and emergency services to the park are provided out of Corbett, through an interagency

agreement with Multnomah County's Fire District 14. Police protection in the Park is provided by OPRD personnel, though OPRD also contracts with the Oregon State Police to patrol the park during the summer months.

Although it is mostly an undeveloped site, the Sandy River Delta experiences many law enforcement problems associated with urban areas due to its close proximity and accessibility from the Portland metro area. The two greatest law enforcement problems on the project site are occupation by transients and indiscriminant use of firearms. Other problems are associated with alcohol consumption, and vandalism of cars.

The FS has prohibited camping within the area designated for Public Recreation/RIC 4. This is consistent with the day use status of other public parks on the Sandy River which lock their gates after dark. The FS and other law enforcement agencies have cooperated on organized sweeps of the area to remove transients camping on the site. With monitoring of the site, this approach has reduced illegal activities.

The FS has adopted weapons restrictions and only shotguns are allowed to be fired on the site. ODFW patrols the area during waterfowl seasons to enforce compliance with hunting regulations.

One FS law enforcement officer is currently assigned to the area on both sides of the river within the NSA. This level of enforcement does not allow for regular patrols of the Delta site or for quick response to calls for service to the site.

The FS does not have any law enforcement jurisdiction on DSL lands in the Delta area. This includes a large portion of the site along the river below the ordinary high water mark.

### **3.13 SITE CONTAMINATION**

Site investigations were conducted and available data reviewed to determine the presence of any environmental contamination within the study area. No signs of environmental contamination, other than the occasional discarded beer bottle, tire and other garbage, were observed during the site investigations. Human waste is a problem on the eastern edge of the site adjacent to the existing boat moorage.

The study area appears to have been used primarily for agricultural purposes, except for the area designated as a gravel pit in Section 25, R3E, T1N. The mature vegetation in this area indicates that the gravel pit has been abandoned for at least several decades. In the past, there were several aggregate extraction operations mining sand and gravel within the lower Sandy River. These operations are closed due to the inclusion of the river in the NSA.

The UPRR, which bisects that portion of the study area south of I-84 (and east of the Sandy River), was constructed in 1882. A highway through the area, which I-84 now covers, was



constructed in the early to mid 1940s. Most of the land making up the I-84 ROW was acquired by the State of Oregon at that time. Construction of I-84 started in the mid 1950s.

Since construction of the original highway in the 1940s and later I-84 in the 1960s, the area between the railroad and highway has been mostly unused, although there is indication of use by off-road bikes and all terrain vehicles. ODOT contractors operated a temporary asphalt batch plant at the western end of the ODOT Triangle subarea about two years ago. All equipment and materials have been removed.

The Jordan Road entrance to Lewis and Clark State Park forms the southern portion of the Jordan Road interchange area. The park improvements, including parking lot, restrooms and picnic areas were developed in the late 1950s, at the same time the Jordan Road interchange was constructed.

In 1990, Level I and Level II Environmental Assessments of the Delta subarea were performed to determine whether previous or current uses of the property had created any potential for environmental contamination. Based on the results of these assessments, no further environmental investigations or remedial activities are warranted at this time. Based on these two reports, a pre-acquisition inspection by FS personnel, and assurances of continued monitoring of emissions by Reynolds Metals Company, the FS agreed to acquire the site from the Trust For Public Lands.

A previous owner of the National Forest land sued Reynolds Aluminum alleging that the Troutdale plant's operations were contaminating the property. As a condition of settlement of the suit, vegetation monitoring for fluoride from emissions from the Reynolds Aluminum Plant is conducted for nine months every year per DEQ requirements. The monitoring is scheduled to continue for as long as DEQ requires. To date, no concentrations of fluoride, beyond permitted levels, have been found.

Reynolds Metals Company is the only entity listed on current environmental lists maintained by DEQ and the USEPA within 1/2-mile of the subject site (Century West Engineering, 1990).

Two water samples collected from the spigot at the Delta site were tested for total coliform count and nitrates, respectively. The spring water was found to meet USEPA drinking water standards.

Electromagnetic field (EMF) emissions from BPA's high-voltage transmission lines in the Delta subarea are discussed under Section 3.6, Land Use and Planning.





## 4.0 ENVIRONMENTAL CONSEQUENCES

### 4.1 INTRODUCTION

This section presents the short-term, long-term, direct and indirect environmental consequences of each of the alternatives discussed in Section 2.0. It addresses the significant issues and potential effects identified during the scoping process (see Section 1.4.2 for discussion of scoping process) -- although not in the same order. It also addresses effects identified in the course of the analysis.

This section follows the order of the topical issues addressed in Section 3.0. Each subsection begins with a brief discussion of the issues to be addressed and the analysis methodology relevant to the issue being discussed. Environmental consequences that are common to all four alternatives are then described, if applicable; followed by a description of the effects of each individual alternative. The alternatives will be compared to the existing conditions as well as the other alternatives, as applicable.

This section also addresses the potential cumulative effects of the alternatives, in a more general level of detail than the project-specific effects. Cumulative effects result from the impacts of each alternative in combination with the impacts of past, present and reasonably foreseeable future projects or actions, either in the vicinity of the site or in the region, that could affect the same resources as those affected by the alternatives. For each topical area, the "cumulative study area" will be different, depending on the resources being affected. At the end of each topical issue, a summary of the potential environmental effects for that topical area is presented.

Following the cumulative effects discussion, each section presents applicable mitigation measures that would reduce or eliminate potentially adverse environmental effects. Mitigation measures are actions above and beyond actions already contained in the alternatives' designs and/or required by local, state or federal laws and regulations. All mitigation measures are recommended by the FS and/or FHWA at this time, and only become binding if an action alternative is approved and the mitigation measures are adopted as part of the Record of Decision.

### 4.2 SOILS AND GEOLOGY

#### **4.2.1 Issues and Analysis Methodology**

The only significant soils issue identified during scoping related to the need for erosion control and river bank stability measures. Implementation of any of the alternatives will require a Temporary Erosion Control and Soil Protection Plan for controlling construction-related

impacts. This section will address this concern, as well as potential construction impacts and geologic hazards.

An alternative is considered to have an adverse soils or geologic impact if it:

- Exposes people or structures to major geologic hazards, including:
  - Severe ground shaking;
  - Liquefaction or other secondary seismic hazards;
  - Surface rupture; or
  - Volcanic eruptions;
- Exposes people or structures to static hazards, such as landsliding or excessively steep slopes, that could result in slope failure;
- Exposes people or structures to soil that is likely to collapse due to unique physical characteristics or subsidence due to groundwater drawdown; shrink or swell; ponding/flooding due to low permeability and drainage characteristics; or
- Causes damage or destruction to a unique geologic feature, such as fossil-bearing formations, mineral deposits, or agriculturally valuable soils.

#### **4.2.2 Alternative 1 - No Action**

Soils throughout the property reflect the historical process of sediment build-up and erosion from river flooding. Surface soils and current geological conditions have been altered by the recent agricultural use of the site. This recent surface usage has included timber harvesting, cattle grazing and mining of the near surface sand and gravel products. The fine-grained soil textures found throughout the site would not be affected if the site were not developed. Artificial controls placed on the water level by damming of the Columbia River have reduced the historic erosional process along the eastern shoreline of the site. Erosion of the shoreline has been replaced with deposition of sand bars and islands along the outside of the river meander. This process can be expected to continue, further isolating the interior of the site from the influences of the river and causing the soils to become more organic from an increase in upland plants. No longer does the annual spring freshet scour the site, removing vegetation and the top layer of soil.

Flooding and scouring of the Sandy River would have a negligible effect on the site due to the deep channel that has been developed along the western boundary of the site. Deposition of granular soil at the mouth of the river can be expected with minimal erosion of the eastern shoreline of the river.

Geological processes that have a direct effect on the site are difficult to predict due to the long recurrence time and lack of historic record. The most direct impact to the site is from the

erosion of the upstream upland areas and deposit of silts, sand and gravels into the delta system. Geologic history for the Columbia River and Sandy River drainages indicates there is the potential for sudden and large geologic events to effect the study area (i.e., earthquakes and volcanic eruptions). Earthquakes could cause both ground shaking and liquefaction of the soils on the site. A volcanic eruption of Mt. Hood or Mt. Adams could send debris and mud flows downstream which would effect the site directly and indirectly.

The no action alternative would not involve any development on the site and would thereby avoid construction-related impacts. The number of people on the site would increase incrementally over time, but this alternative would expose the smallest number of people to geologic hazards as the result of a major regional geologic event.

#### **4.2.3 Alternative 2**

Alternative 2 would create the greatest variety of site changes, development and landscape diversity. The increase in recreational activities within the study area would have a direct effect on the surface soils. An extensive system of trails would be developed for hikers, mountain bikers, and equestrians. Each activity would have a different effect on the surface soils based on the natural textural and hydric conditions. In addition to the system of trails, access to the site would be improved through the modifications to the interchange and Jordan Road, and construction of new roads, parking and support facilities within the study area.

Soil characteristics and textural conditions examined throughout the study area were found to be capable of supporting the gateway, recreational, and interchange improvements with appropriate site preparation and management. The fine grain soils are considered to be prone to excessive erosion if exposed. The soils have also been described as being loose, cohesionless and erosion sensitive. The more granular sandy soil is loose but is not reported to be compressible. Support facilities within the study area can be supported by properly prepared soil. The fine grain texture of the soils north of I-84 would tend to hold surface water while the more granular soils found south of I-84 would be more permeable.

Trails utilized by hikers would experience the least amount of deterioration due to the loose nature of the native soils. Mountain bikes would cause erosion and deterioration of the surface soils. Equestrian trails would become somewhat over-compacted below a loose surface. The weight of the horses and size of the hooves would compact the surface and near surface soils along the trail. Surface soils would generally remain soft.

Support facilities, including bathrooms, are proposed at the gateway, for campers along the Columbia River, and adjacent to the boat-in access on the east of the site. Soils in the area of the proposed gateway could support an on-site, subsurface sewage disposal system, depending on its size and precise location. The use of composting toilets and a treatment wetland (as proposed) would further reduce impacts. Only areas above the 100-year flood hazard zone should be considered for septic systems because of the potential for ground and surface water



contamination in other areas. Therefore, the restrooms proposed adjacent to the boat dock and camping area should not rely on on-site treatment and disposal.

I-84 and the Jordan Road interchange are built on fill soils which can support these structures and traffic. The proposed folded diamond interchange would require additional fill to raise the road and interchange approximately 9 feet above its current elevation. Suitable fill material is found on the site, or could be imported from other areas.

Geological conditions would not be significantly affected by the development proposed in Alternative 2. However, this alternative would result in a greater number of people using the Delta, and thus a greater number of people potentially exposed to the geologic hazards of the site (i.e., earthquakes and volcanic eruptions). The impact of a major volcanic eruption in the region would be the same for all alternatives. In the event of a major earthquake in the Portland area, the loose, cohesionless soils on the site could liquify -- particularly in areas where the water table is high. In general, the stronger the anticipated ground motion and the longer the duration of the event, the greater the risk of strength loss in soil deposits. The loss of support beneath building footings can result in differential settlement or bearing capacity failures. The gateway facility could be affected by this phenomenon.

If the soil layers which fail are tilted toward the river, the result can be lateral spreading, with the soil sliding into the river. To avoid this, a site specific geotechnical investigation should be conducted prior to final design to establish criteria for site preparation, grading, foundations and floor support, pavements, and riverbank slopes adjacent to waterfront structures. In addition, all buildings will be constructed to Uniform Building Code standards, and the risk to site users will be no greater than in other locations in the region.

#### **4.2.4 Alternative 3**

Open landscapes and moderate recreational development are proposed in Alternative 3. Site development would involve the modified interchange and Jordan Road, hiking and mountain biking trails, limited access roads, a gateway center, a caretaker's residence/restoration center and additional parking. Effects to the native soils used for the trail system would be reduced (compared to Alternatives 1 and 2) due to the elimination of equestrian use. Compaction of the soils underlying the trail system would be negligible due to the limited usage. Erosion potential for the soils adjacent to the trails and roadways would remain.

In order to maintain the open habitat, grazing has been proposed. The use of smaller grazing animals (sheep or goats rather than horses or cattle) would prevent the compaction and surface disturbance created by larger animals. Stock management and monitoring would prevent over-grazing, soil deterioration and increased nitrate loading to the near surface soils in those areas used for livestock grazing.

The gateway facility would be located south of I-84, on fill soils which are more suitable for construction of buildings without additional site preparation and foundation work. Therefore, the cost of construction of the facility would be reduced in this alternative. The impacts of interchange construction would be similar to Alternative 2.

The proposed restoration center and caretaker's residence would be located in the same area proposed for the gateway in Alternative 2. Soils in this area could support the modest building proposed (1,500 square feet) with appropriate site preparation and foundations. Support facilities and the caretaker's residence would include development of an on-site, underground sewage disposal system. The soils in the area proposed for this facility would support this use. Impacts could be further reduced by the use of composting toilets and the treatment wetland, as proposed.

Geologic conditions would not be affected by the proposed development in Alternative 3. However, this alternative would also result in a greater number of people using the Delta, and thus increase the number of people potentially exposed to the geologic hazards associated with the site location and morphology (i.e., earthquakes and volcanic eruptions). The impacts would be less for this alternative than Alternative 2, because it is assumed that fewer people would be attracted to the site.

#### **4.2.5 Alternative 4**

Alternative 4 would result in the least amount of new recreational development of all the action alternatives. The reduction in human usage of the site would result in less surface soil erosion. Trails would be constructed on a limited basis for use by hikers and fishermen only. No equestrian or trail bike use would be permitted. This alternative would involve no building north of I-84, and thus special site preparation for foundations or sewage disposal systems would not be needed. The kiosk proposed as the gateway information center would require no special site preparation.

Surface soils would not be significantly affected by the introduction of more vegetation and wildlife. Vegetation would provide increased stability to the surface and near surface soils through root systems and dispersion of precipitation. Like Alternatives 2 and 3, geologic events could have a direct effect on the site, but it is assumed that fewer people would be exposed in this alternative.

This alternative would also require filling to raise I-84 and the interchange, but there would be no tunneling under the railroad involved because Jordan Road would remain in its current alignment. As a result, the current railroad undercrossing would be improved by filling approximately 30 to 50 feet out into the Sandy River. This would involve construction of a retaining wall to minimize fill into the river. Because the banks of the river are not stable, footings going to bedrock would be required.

#### **4.2.6 Alternative 5**

Alternative 5 would have open landscape on the southeastern portion of the Delta and reforest Sun Dial Island. The recreation facilities and trail would be very similar to Alternative 3, and no equestrian use would be permitted. Therefore, construction and long-term use impacts of Alternative 5 are expected to be similar to Alternative 3.

If grazing is used as a vegetarian management technique, the use of smaller grazing animals (sheep or goats rather than horses or cattle) would minimize soil compaction and surface soil disturbance. Monitoring and careful stock management would prevent over-grazing, soil deterioration, and increased nitrate loading of near-surface soils.

A gateway kiosk would be located south of I-84 in Alternative 5, and would have impacts similar to Alternative 4. Soils south of I-84 are suitable for the proposed gateway and support facilities. The restoration center and caretaker's residence would be the same size and location as Alternative 3, and would have the same impacts. Soils in the little meadow are fill, and could support the modest facility, with appropriate site preparation and foundations.

Geologic conditions would not be affected by the proposal, but the development would increase the number of people exposed to existing risks. The number of people so exposed would be less than Alternative 2, the same as Alternative 3, and more than Alternative 4.

#### **4.2.7 Cumulative Effects**

Off-site development would have no direct effect on the surface soils of the Delta, and the development proposed for the site would not affect off-site resources. The soils described throughout the analysis area consist of fine to medium grained silts and sands that are loose and considered highly erodible. Sandy soil is accumulating along the eastern shoreline due to the artificial control of the Columbia River level. The northern portion of the site is also accumulating sand and silt from the Sandy River. As more soil is added to the perimeter of the Delta, the interior soils will accumulate and become more organic. The site is no longer exposed to large flooding events from the rivers that scoured away the top layer of soil and vegetation. Even the proposed alteration of the flow regime of the Columbia River to assist in the recovery of Snake River salmon would be unlikely to alter this pattern.

Development of small support facilities would not effect the native soils. Structural development north of I-84 would involve consolidation or compaction of the native soil and would utilize the soil for on-site sewage disposal. The size of the proposed facilities could be accommodated on-site with no adverse effects off-site.

#### 4.2.8 Mitigation Measures

The following mitigation measures are proposed to reduce the impacts of proposed development.

- 4.2 - 1. Trail construction within the study area will utilize standard compaction or vibratory techniques to prepare the sandy soils.
- 4.2 - 2. Side slopes of exposed soil will be protected from excessive erosion by replanting or utilizing some other acceptable control.
- 4.2 - 3. Construction of the gateway facility or restoration center will utilize standard compaction techniques to prepare the soils, and include spread footings for foundations.
- 4.2 - 4. Use of subsurface sewage disposal systems will be avoided in areas located below the 100-year flood elevation. Use of composting toilets and the treatment wetland (as proposed) will mitigate potential risk of septic system failure due to slow-draining soils in the area north of I-84.
- 4.2 - 5. All structures should be built to Uniform Building Code Standards for the earthquake risk of the area.
- 4.2 - 6. Construction of the interchange improvements and selection of soil fill material would be conducted in accordance with geotechnical recommendations specific to the site and soils being utilized.

#### 4.2.9 Summary

A summary of the soils and geology effects is presented in Table 4.2-1. As shown in the table, erosion could occur with Alternatives 2, 3, and 5 but these effects can be mitigated through proper design and construction of the trails. Also, effects from earthquakes (i.e., ground movement and liquefaction) can be mitigated through the proper design of foundations for structures (including the interchange) and compliance with the Uniform Building Code Standards applicable to this earthquake risk area.



**TABLE 4.2-1  
SUMMARY OF SOILS AND GEOLOGY EFFECTS**

<i><b>EFFECTS</b></i>	<i><b>ALTERNATIVE 1</b></i>	<i><b>ALTERNATIVE 2</b></i>	<i><b>ALTERNATIVE 3</b></i>	<i><b>ALTERNATIVE 4</b></i>	<i><b>ALTERNATIVE 5</b></i>
<b>Surface soil erosion</b>	No changes from existing conditions	Increased erosion potential for unprotected soil adjacent to trails.	Increased erosion potential for unprotected soil adjacent to trails.	Increased erosion potential for unprotected soil adjacent to trails	Increased erosion potential for unprotected soil adjacent to trails
<b>Surface soil compaction due to trail and road development and usage</b>	No change from existing conditions	Biking and equestrian use could compact soils on trails.	Mountain bikes could compact soils on trails.	Minimal compaction expected from hiking only trails	Mountain bikes could compact soils on trails
<b>On-site sewage disposal systems</b>	No change from existing conditions	Composting toilets and treatment wetland to serve gateway. Port-a-potties for other areas.	Smaller facility utilizing composting toilets and treatment wetland.	No restrooms north of I-84	Composting toilets and treatment wetland to serve restoration center; port-a-potties for other areas
<b>Potential for ground movement and liquefaction as a result of a major earthquake to affect development</b>	No change from existing conditions	Largest gateway facility located on less stable soils north of I-84. Most use of site.	Construction of gateway on more stable soils, restoration center on less stable soils.	Limited development located on more stable soils	Construction of gateway on more stable soils; restoration center on less stable soils

## **4.3 HYDROLOGY**

### **4.3.1 Issues and Analysis Methodology**

This section addresses issues concerning surface and ground waters, wetlands, riparian reserves, and water quality. Within the regional context, the Sandy River Delta site is at the confluence of the 240,000-square mile Columbia River basin, and the 500-square mile Sandy River sub-basin. The watershed impacts from this approximately 2,500 acre site are minuscule in this context.

Flooding, groundwater, and riparian issues are considered in terms of the Columbia River because the Columbia dominates these functions. Wetlands are considered in terms of the

Columbia River because of the relationship with groundwater. Stormwater and water quality are considered in terms of the Sandy River because the most intensive development proposed for the site adjacent to the Sandy River as well as in its drainage. These impacts are also considered with respect to the Columbia River because of the cumulative impacts this water system will experience from site development.

The standards used to judge each potential impact are federal and state water quality standards, state antidegradation standards, and floodplain protection regulations from the Clean Water Act (CWA), Executive Order 11098 and the Federal Ecosystem Management Assessment Team (FEMAT) guidelines.

Specifically, the effects of an alternative are considered adverse if it would:

- Cause substantial flooding by filling or reducing ability of floodplain to pass flows, creation of new impervious surface equal or greater than 10 percent of the site, or locate structures in the floodplain; or,
- Interfere substantially with groundwater recharge, or groundwater flow patterns; or,
- Result in the substantial loss of wetlands independent of mitigation; or,
- Result in the substantial loss of riparian areas adjacent to streams; or,
- Cause substantial erosion, or sedimentation; or
- Substantially degrade surface water quality by exceeding applicable water quality standards.

#### **4.3.2 Alternative 1 - No Action**

Alternative 1 would not actively alter the site. Reforestation would slowly take place beginning in the wetter areas with willows, red alder, and black cottonwood; leading after many years to the return of a climax forest over much of the site. No additional impervious surface would be added, nor would drainage and runoff patterns be changed, other than by natural action.

#### ***Surface Water and Groundwater***

Eventually, the natural reforestation could result in marginally slower rates of runoff, and higher soil moisture. These possible outcomes would be a function of the canopy of climax forest vegetation. In terms of rainfall runoff, the dense leaf cover (compared to existing vegetation) would tend to break rainfall impact momentum on the ground, leading to slightly slower runoff rates. The canopy would also detain a small percentage of rainfall on the trees to be released slowly. These results of a forest canopy would create an increased opportunity for infiltration to groundwater tables. Net soil moisture levels could increase slightly due to the shadier conditions marginally reducing evaporation in heavily shaded areas.

The BPA transmission corridors would not reforest, as on-going maintenance activities would not allow development of conifer forest in these areas. At the most, it is possible that the area would be planted trees having a maximum mature height of 30 to 40 feet according to BPA revegetation policy. Two surface water areas are affected by these management activities: the old Sandy River channel, and the inverted-Y drainage canals adjacent to I-84. The BPA easement crosses both of these, ensuring that at least a portion would remain clear.

### *Wetlands*

Currently there are 123 acres of forested/scrub-shrub wetland, 84 acres of wet meadow, and 66 acres of open water for a total of 273 acres of wetland.

Perched water tables in and adjacent to wetlands could stay wet longer under the cover of a forest which could result in a slight expansion of wetlands from the edges of existing wetlands as described in the previous sub-section. Wetland class (as described by Cowardin, et al.) composition is expected to shift toward more Palustrine Scrub-Shrub, and Palustrine Forested as reforestation takes place. Thus, wet meadows and open water wetlands are anticipated to advance into scrub-shrub and forested wetland, except where BPA maintenance activity would maintain a more open habitat.

### *Riparian Areas*

With the exception of the BPA corridors noted above, riparian areas would naturally reforest. The target species of concern for the project site include salmon and steelhead. The riparian areas function to provide shade to keep stream temperatures down, food by insect drop, and cover by addition of large woody debris.

### *Water Quality*

Increased coverage and height of trees adjacent to water resources would result in somewhat lower water temperatures. Lower water temperatures are considered desirable because this means higher dissolved oxygen levels for fish and other organisms. Without development, other water quality parameters such as sediment, turbidity, oil and grease, and bacteria are expected to remain at present levels.

Localized water quality problems could develop if use continues to increase without provision of sanitary facilities for visitors. It is not possible to define the extent of this potential problem, but the areas most likely to be affected are the popular shorelines currently used by boaters.

### 4.3.3 Alternative 2

Alternative 2 creates maximum landscape diversity and involves the most extensive recreational facilities. Features which could affect water resources include a 5,000-square foot Gateway facility with 225 parking places proposed for north of I-84, along with a folded diamond interchange and widening of the existing I-84 bridge; barrier-free hiking, biking and equestrian trails throughout the site; a fishing pier and access road to the Sandy River near the split of the old and new channels; and support facilities for the boat access on the Columbia River near Flag island. Wetland enhancement and creation is proposed which would increase wetland area.

#### *Surface Water and Groundwater*

Impervious surface area on-site would increase by 2 acres due to construction of the Gateway facility and the associated parking. The access road and parking for fishing access would add 2 acres of impervious surfaces. In order to avoid paving within the floodplain of the Sandy River pervious surfaces (e.g. grass pavers) are proposed. Highway improvements for the Jordan Road interchange would add 5 acres of impervious surface. A total of 9 acres of new impervious surface would result from this alternative.

The realigned Jordan Road would include two undercrossings: under the railroad, and under I-84 with a folded diamond interchange. The railroad undercrossing would have the lowest road surface elevation at approximately 28 feet, or about 4 feet below the 100-year flood surface. The 28 foot elevation is approximately that for the 25-year storm event. The undercrossing of I-84 is proposed at 30 feet, or the 50-year storm event stage. Maximum observed gauge height during the period of record (1971-1981, 1990 to present) at the USGS stage gauge on the Columbia River at Washougal is 28.9 feet. The roadway embankment on either side of the undercrossing would act as a dike for flood surfaces up to 30 feet, but groundwater may seep into the area when flood waters exceed 28 feet. Statistically, this means that the access to Sandy River Delta could be flooded about every 25 years, when most of the site would be flooded.

The proposed facilities in Alternative 2 would result in a marginally shorter time of concentration of stormwater in the southwest portion of the site, and seal nine acres from groundwater recharge. Enhancement of the inverted-Y canals to wetland meadow would result in a longer time of concentration in that portion of the Thousand Acres by removal of the existing channels and by whatever outlet structure is developed at the north end of this wetland complex.

Water use by visitors is not expected to result in any change in groundwater resources because withdrawal for supply and input from wastewater are expected to balance.



### *Wetlands*

Alternative 2 includes 190 acres of forested/scrub-shrub wetland, 171 acres of wet meadow, and 44 acres of open water. Net wetland area would increase by 133 acres to a total of 406 acres. All classes of wetland would expand on-site except for open water which would decrease as part of a large expansion of wetland meadows on the Thousand Acres surrounding the inverted-Y canals. The forested/scrub-shrub wetland proposed on Sun Dial Island would provide an additional wetland corridor in comparison with Alternative 1.

This alternative includes construction of a trail adjacent to and through the wet meadow on the Thousand Acres. In order to avoid filling wetlands and disrupting hydrology, this trail would be an elevated boardwalk, or other pervious surface.

Wetland impacts for this alternative are discussed in Section 4.4.3 of the Natural Resources Section.

### *Riparian Areas*

The large upland scrub-shrub proposed for Sun Dial Island under the BPA powerlines would result in an increase of this habitat type in comparison with Alternative 1. Trail development would result in removal of some riparian vegetation. All of the trails on National Forest land are located in Riparian Reserve areas because virtually the entire site is within the 100-year floodplain of the Sandy or Columbia rivers. Providing improved trails would reduce the use of informal, volunteer trails. Keeping people off informal trails would allow riparian vegetation to re-establish in these areas and prevent erosion. The gain in riparian cover from channeling use to one trail would off-set the loss from trail development.

### *Water Quality*

There would be both short-term, construction-related impacts and longer lasting changes to water quality on-site.

In the short-term, construction of the Alternative 2 would affect approximately 20 acres for portions of the construction period. During this time, the site would be vulnerable to transport of sediment from road earthwork, trail building, building construction, and wetlands construction. An erosion control plan would be required as part of a National Pollution Discharge Elimination System (NPDES) permit mandated by Section 401 of the CWA. Proposed erosion control measures would be reviewed by DEQ prior to issuance of the NPDES permit.

The net long-term result would be the addition of 9 acres of impervious surface. Stormwater from these surfaces would contain oil and grease, and heavy metals from vehicles, and nutrients. These constituents would require treatment prior to discharge to the receiving bodies (primarily the Sandy River). Asphalt surfaces tend to heat water slightly due to transfer of heat

from solar radiation, and thus a very slight increase in the water temperature of this runoff is expected. However, the volume would be so small that any impact to the Sandy River is not expected to be detectable.

Alternative 2 would include an easily accessible fishing site on the Sandy River at the mouth of the old Sandy River channel. This is across the river and downstream of the outfall for the Troutdale Sewage Treatment Plan. No adverse effects on site users are expected because the fishing site is over a half mile from the outfall and well outside the mixing zone. In addition, water contact recreation is not planned.

Runoff from impervious surfaces would be treated by filter strips, biofiltration swales, and/or other site appropriate methods. To the extent practical, stormwater runoff will be dispersed rather than collected from large areas in order to minimize collateral site disturbance.

A three-acre effluent treatment wetland is proposed as part of the development. The constructed wetlands would process liquids from the gateway center, and the screened solids would need to be treated off site. No significant adverse effect on the quality of groundwater or other surface water features would be expected because the initial treatment lagoon would be contained and possibly lined. All effluent entering the wetlands would be treated to approximately secondary levels.

Composting toilets would be contained and would not affect groundwater or surface water quality (except perhaps under extreme flooding conditions when dilution would be high).

#### **4.3.4 Alternative 3**

Alternative 3 would maintain a more open landscape, and involve fewer recreational facilities than Alternative 2. Facilities that could affect water resources include a 2,500 square foot Restoration Center with 100 parking places proposed for north of I-84; a 1,500 square foot Gateway Center with 75 spaces proposed south of I-84; the same folded diamond interchange and widening of the existing I-84 bridge as in Alternative 2; and bicycle and hiking trails. Barrier-Free and hiking trails would be developed, but to a more limited degree than in Alternative 2. Wetland enhancement and creation is proposed which would increase wetlands from 273 acres to 428 total acres.

#### ***Surface Water and Groundwater***

Impervious surface area would increase by 1 acre due to construction of the Restoration Center and the associated parking. The paved access road would add 1.5 acres of impervious surfaces. The Gateway Center and its parking areas would add approximately 1 acre of impervious surface. Highway improvements would add 5 acres of impervious surface. A total of approximately 8 acres of new impervious surface would result from this alternative.

As with Alternative 2, a folded diamond interchange is proposed with the realignment of Jordan Road with the same effects.

Water use by visitors is not expected to result in any change in groundwater resources because withdrawal for supply and input from wastewater via the treatment wetland would balance.

### *Wetlands*

Alternative 3 includes 155 acres of forested/scrub-shrub wetland, 141 acres of wet meadow, and 131 acres of open water. Net wetland area would increase by 155 acres to a total of 428 acres. All classes of wetland would expand on-site, especially wetland meadow and open water. A wetland corridor is also proposed on Sun Dial Island which would be primarily wet meadow and open water. A large contiguous open water system is proposed for the area surrounding the inverted-Y drainage ditches and eastern slough areas on the Thousand Acres. Creation of these wetland and open water areas would require grading, at least on the Sun Dial Island and probably the Thousand Acres.

Wetland impacts for this alternative are discussed in Section 4.4.4 of the Natural Resources section.

### *Riparian Areas*

This alternative includes large expanses of upland meadow adjacent to the Sandy and Columbia rivers. Most of the trails are located in Riparian Reserves area because most of the site is classified as Riparian Reserve since it is within the 100-year floodplain of the Sandy or Columbia rivers. Trail development would remove riparian vegetation. However, providing improved trails with river access would decrease the use of informal and volunteer trails, which would allow these areas to revegetate.

### *Water Quality*

There would be both short-term, construction related impacts, and longer lasting changes to water quality on-site.

In the short-term, construction of Alternative 3 would open approximately 18 acres for portions of the construction period. During this time, the site would be vulnerable to transport of sediment from road earthwork, trail building, building construction, and wetlands construction.

The net long-term result would be the addition of 8 acres of impervious surface. As in Alternative 2, runoff from impervious surfaces would be treated by filter strips, biofiltration swales, and/or other site appropriate methods. To the extent practical, stormwater runoff would be dispersed rather than collected from large areas in order to minimize collateral site disturbance.

In order to maintain the upland meadow habitat, grazing has been proposed. Stock management and monitoring would prevent over-grazing, soil deterioration, and nitrate loading to surface and ground water. Use of small grazing animals would also reduce potential erosional effects.

The treatment wetland to be used for the caretaker's residence and restoration center would have the same effects as are described for the treatment wetland in Alternative 2. The on-site wastewater treatment system for the gateway center south of I-84 would be designed in accordance with applicable regulations and would not affect groundwater or surface water quality.

#### **4.3.5 Alternative 4**

Alternative 4 creates a forested landscape and involves the fewest recreation facilities. No development other than trails is proposed north of I-84. An unstaffed information kiosk with parking for 75 cars is proposed as a Gateway Center south of I-84. Alternative 4 includes a diamond interchange with a widened undercrossing for the railroad, a new I-84 undercrossing, and widening the I-84 bridge. Universal design and hiking trails would be developed, but to a very limited extent. No formal boat access is proposed. Wetland enhancement and creation is proposed which would increase wetlands.

#### ***Surface Water and Groundwater***

Reforestation would result in marginally slower runoff rates and higher soil moisture. This would create greater opportunity for groundwater recharge on the site. Impervious surface area would increase by 1 acre due to construction of the Gateway facility and the associated parking. Highway improvements would add 5 acres of impervious surface. A total of 6 acres of new impervious surface would result from this alternative.

This alternative would use a full diamond interchange and would redirect Jordan Road around to the north of the railroad. Jordan Road would pass through a widened undercrossing of the railroad and a new undercrossing of I-84 to access National Forest land on the Delta. The railroad undercrossing would have the lowest road surface elevation at approximately 28 feet, or about 4 feet below the 100-year flood surface. The 28 foot elevation is approximately that for the 25-year storm event. As indicated in Section 3, maximum observed gauge height during the period of record (1971-1981, 1990 to present) at the USGS stage gauge on the Columbia River at Washougal is 28.9 feet. Statistically, this means that the access to Sandy River Delta could be flooded about every 25 years.

Widening the railroad undercrossing will result in fill into the Sandy River. The floodplain incursion required for safer Jordan Road geometry could be mitigated with the addition of floodplain storage between Jordan Road and I-84. Selective use of retaining walls with



bioengineering techniques would help mitigate visual impacts from the river as well as minimizing the area filled.

The proposed facilities in Alternative 4 would result in a marginally shorter time of concentration of stormwater in the southwest portion of the site, and seal 6 acres from groundwater recharge. Enhancement of the inverted-Y canals to wetland meadow and open water would result in a longer time of concentration in that portion of the Thousand Acres by removal of the existing channels and by whatever outlet structure is developed at the north end of this wetland complex.

No toilet facilities are included in Alternative 4.

### *Wetlands*

Net wetland area would increase by 197 acres to a total of 460 acres. Most of the gain would be in forested wetland. There would be a slight decline in wet meadow area, from 84 existing to 77 proposed acres. Alternative 4 includes 291 acres of forested/scrub-shrub wetland, 77 acres of wet meadow, and 91 acres of open water.

Wetland impacts for this alternative are discussed in Section 4.4.5 of the Natural Resources Section.

### *Riparian Areas*

This alternative includes large expanses of upland forest and wetland forest adjacent to the Sandy and Columbia Rivers. This would provide additional shade for the Sandy River, and it would also provide woody debris to the channel.

### *Water Quality*

There would be both short-term, construction related impacts, and longer lasting changes to water quality on-site.

In the short-term, construction of Alternative 4 would open approximately 14 acres for portions of the construction period. During this time, the site would be vulnerable to transport of sediment from road earthwork, trail building, building construction, and wetlands construction. Impacts are addressed from both short-term and long-term perspectives.

An erosion control plan would be required as part of a NPDES permit mandated by Section 401 of the CWA. Proposed erosion control measures would be reviewed by DEQ prior to issuance of the NPDES permit.

The net long-term result would be the addition of 6 acres of impervious surface. As with the other alternatives, runoff from impervious surfaces would be treated by filter strips, biofiltration

swales, and/or other site appropriate methods. To the extent practical, stormwater runoff will be dispersed rather than collected from large areas in order to minimize collateral site disturbance.

#### **4.3.6 Alternative 5**

Alternative 5 would maintain a more open landscape of the Thousand Acres (similar to Alternative 3) and reforest the Sun Dial Island, except for the BPA right-of-way which would be planted in shrub-scrub vegetation (similar to Alternative 2). Recreation development locations would be essentially the same as Alternative 3. The gateway would be a kiosk south of I-84.

##### ***Surface Water and Groundwater***

A total of approximately 8 acres of new impervious surface would result from this alternative, as in Alternative 3, and the effects would be similar -- that is, not significant.

As with Alternatives 2 and 3, a folded diamond interchange has been proposed together with the realignment of Jordan Road. The impacts would be the same as those described above.

Run-off will be treated in bio-filtration swales prior to absorption to groundwater or release to the Sandy or Columbia rivers. Water use by visitors is not expected to result in any change in groundwater resources because it would be balanced by input from the treatment wetland.

##### ***Wetlands***

Alternative 5 includes 198 acres of forested scrub/shrub wetland, 129 acres of wet meadow, and 128 acres of open water. Net wetland area would increase by 182 acres to a total of 455 acres. Most of this would be on the Thousand Acres, as in Alternative 3.

Wetland impacts for this alternative are discussed in Section 4.4.6 of the Natural Resources section.

##### ***Riparian Areas***

This alternative would reforest virtually all of the Sandy River shoreline and the Columbia River shoreline on the Sun Dial Island. Although trail development would remove riparian vegetation, providing improved river access trails would reduce the use of informal trails and the erosional impacts associated with them. Most of the trails are in Riparian Reserve areas since virtually the entire site is classified as Riparian Reserve because it is within the 100-year floodplain of the Sandy or Columbia rivers.

### *Water Quality*

Short-term, construction-related impacts would be controlled by instituting an erosion control plan. Potential long-term impacts would be mitigated by on-site treatment as described for Alternative 3. The proposed Sandy River fishing access trail is over a half mile from the Troutdale STP outfall, and well outside the mixing zone, so no potential adverse effects are anticipated.

#### **4.3.7 Cumulative Effects**

A number of actions have occurred, are occurring, and may occur which would affect the site/impact area in one way or another. These are described in the following paragraphs.

### *Regulation of the Columbia River*

Common to all the alternatives would be revised flows for the Columbia River as part of the salmon enhancement program evaluated by the Columbia River System Operation Review (SOR). The SOR identifies slightly increased discharge to flush young salmon out during what used to be the Spring Freshet. The most recent proposed flow modification would result in an approximately five percent increase in the Spring Freshet. Reservoir pool elevation manipulations with the dams will not affect the Sandy River Delta site. Sediment transport may increase slightly below Bonneville Dam as a result of the flushing. There would be no discernable impact on flood water elevations, but the Columbia River Spring Freshet would increase in its daily discharge, and/or its period would increase.

### *Aquatic Conservation Strategy Objectives of the President's Plan*

There are four components of this strategy: Riparian Reserves, Key Watersheds, Watershed Analysis, and Watershed Restoration. Together, these components are intended to maintain and restore riparian and aquatic systems. The proposed alternatives will be examined in terms of two of these components: Riparian Reserves and Restoration.

Riparian Reserves are those areas which are physically and functionally connected to streams and rivers. These are the portions of watersheds which directly sustain hydrologic, geomorphic, and ecologic processes portions of watersheds which include streams, lakes, ponds, and wetlands.

Riparian Reserve Widths are described for streams on the basis of five categories of waterbodies. The Sandy River Delta site is bounded by two fish bearing streams which defines the set aside as the outer edges of the 100-year flood plain, or 300 feet slope distance, whichever is greatest. Since the Columbia River and Sandy River flood plains cover most of the site, the area north of I-84 is to be managed with a primary emphasis on riparian dependent resources. The guidelines for such areas are that proposed activity must either maintain the

status quo, or move the conditions "within the range of natural variability," i.e. improve long-term conditions.

Alternatives 2, 3, and 5 would enhance the condition of the Riparian Reserves by moving Jordan Road away from the Sandy River. Alternative 4 keeps Jordan Road in the same location, which essentially maintains the status quo. The increases in the impervious surface due to gateway and recreational development would be offset by the extensive landscape enhancement or restoration proposed for the site in the various alternatives.

### ***Dredge Disposal***

The Columbia River shoreline of Sun Dial Island is a designated ACOE dredge disposal site. The site is a low priority beach nourishment site that was last used in 1976. According to ACOE, the site may be needed in the future for maintaining the navigation channel of the Columbia River along that reach. Any future use of the site for dredge disposal would require a consistency review from the NSA.

Dredge disposal would have at least two impacts. The first, and most obvious impact would be the turbidity associated with the disposal operations; this turbidity would extend downstream some distance. Since the Columbia River shoreline at the project site is a prograding, or building shoreline, additional sediment deposition would accelerate the beach building already underway.

Further dredge disposal would likely impact the Sandy Slough with impeded flow into and out of the slough, and by increasing water temperature.

### ***Surface Water and Groundwater***

None of the action alternatives develop more than a few acres of impervious surface on a 1,700 acre site. The additional runoff generated by the development alternatives would not be substantial. Furthermore, adequate buffers exist between the proposed development and the receiving bodies to detain stormwater generated on those impervious surfaces.

Groundwater impacts are not seen as contributing to cumulative impacts in the Columbia River basin because the volumes of water are relatively small for the proposed facilities.

### ***Wetlands***

All of the action alternatives propose expansion of existing wetlands. The minimum increase is 133 acres, over the 273 acres currently. This is likely to be a cumulative benefit due to previous losses of wetlands in the Columbia system due to the construction of the dams, agriculture, and other development.



### *Riparian Areas*

The action alternatives have minimal impacts to the riparian areas of the Sandy and the Columbia rivers. Alternatives 2, 4, and 5 would have a beneficial effect on riparian areas.

### *Water Quality*

The action alternatives are neutral in terms of cumulative impacts on water quality. Although the proposed alternatives would add additional impervious surfaces, the stormwater runoff from these surfaces would be treated while the existing runoff is not required to be treated. Grazing for vegetation control would be managed to minimize water quality impacts.

## **4.3.8 Mitigation Measures**

### *Surface Water and Groundwater*

No mitigation measures are required beyond those already incorporated in the proposed alternatives or required by state law.

### *Wetlands*

No mitigation measures are required. DSL and ACOE permits must be obtained prior to construction, and these will set mitigation requirements. Fills are not extensive are associated with freeway and access improvements and are accompanied by mitigation. Net wetland area would increase with each action alternative.

### *Riparian Areas*

- 4.3 - 1. A natural resources mitigation plan, as required by the NSA Management Plan, will be prepared. This mitigation plan will contain measures to mitigate impacts on sensitive resources.

### *Water Quality*

- 4.3 - 2. Construction on approximately 20 acres adjacent to wetlands and the Sandy River will require an erosion control plan be developed and implemented. Elements of the erosion control plan would be worked out through the NPDES permit required from DEQ.

#### 4.3.9 Summary

Impacts of the alternatives are not substantial because mitigation measures have been incorporated into the project design of each alternative to protect water resources and water quality. Permits from DEQ, ACOE, and DSL will set regulations and mitigation for construction impacts. Wetland effects would be considered beneficial. Table 4.3-1 presents a summary of the hydrology effects of each alternative.

The proposed alternatives are consistent with the regulations and goals cited in Section 3.3.3. The proposed restoration activities enlarge and enhance wetlands, and enhance riparian areas, especially with Alternatives 2, 3, and 5 through relocation of Jordan Road. Water quality facilities for stormwater treatment would result in improvements in local water quality.

**TABLE 4.3-1  
SUMMARY OF HYDROLOGY EFFECTS**

<i>EFFECTS</i>	<i>ALTERNATIVE 1</i>	<i>ALTERNATIVE 2</i>	<i>ALTERNATIVE 3</i>	<i>ALTERNATIVE 4</i>	<i>ALTERNATIVE 5</i>
Substantial flooding, creation of new impervious surface, or development of floodplain?	No change from existing conditions	9 Ac. impervious surfaces RR undercrossing @ 28'	8 Ac. impervious surfaces RR undercrossing @ 28'	6 Ac. impervious surfaces RR undercrossing @ 28'	8 Ac. impervious surfaces RR undercrossing @ 28'
Substantial interference with groundwater?	No change from existing conditions	RR undercr. @ 28' wetlands grading	RR undercr. @ 28' wetlands grading	RR undercr. @ 28' wetlands grading	RR undercr. @ 28' wetlands grading
Would there be a wetland area increase?	No change from existing conditions (273 acres)	+133 Ac., total 406 Ac.	+156 Ac., total 428 Ac.	+197 Ac., total 460 Ac.	+182 acres, total 455 acres
Substantial loss of riparian areas?	No change from existing conditions	12-15 miles of trail in riparian reserve	7-9 miles of improved trails in riparian reserve	4-6 miles of improved trails in riparian reserve	7-9 miles of improved trails in riparian reserve
Substantial erosion or sedimentation?	No change from existing conditions (8 miles of unimproved trails in riparian reserve area)	20 Ac. construction	18 Ac. construction	14 Ac. construction	20 Ac. construction
Substantial degradation of water quality?	No change from existing conditions	9 Ac. impervious surface 3 Ac. treatment wetland	8 Ac. impervious surface 3 Ac. treatment wetland	6 Ac. impervious surface	8 Ac. impervious surface 3 Ac. treatment wetland

## **4.4 NATURAL RESOURCES**

### **4.4.1 Issues and Analysis Methodology**

This section analyzes the potential impacts of the proposed action on biological resources, including vegetation, wildlife, threatened and endangered species, and other sensitive species, and wetlands. Significant issues listed in Chapter 1 that are discussed in this section include: control of noxious weeds and reintroduction of native species, wetlands restoration and habitat restoration and enhancement.

A project is considered to have an adverse effect on flora and fauna if it:

- Substantially affects an endangered, threatened, or other sensitive species or its habitat.
- Substantially interferes with movement of any resident or migratory fish and/or wildlife species.
- Substantially diminishes or degrades habitat for fish, wildlife, or plants.
- Adversely affects significant riparian lands, wetlands, or other wildlife habitats.

### **4.4.2 Alternative 1 - No Action**

#### ***Landscape Pattern***

If the no action alternative is selected, natural vegetation succession would continue indefinitely. Drier portions of the site would eventually become dominated by coniferous forest (assuming the dams on the Columbia River stay in place). The dominant tree species would probably be grand fir, with minor components of western red cedar, western hemlock, and Douglas fir. The wetter portions of the site would most likely be dominated by Oregon ash, black cottonwood, and willows along the edges with herbaceous species in the deepest and wettest areas.

#### ***Vegetation Management***

Removal of cattle has allowed grasses (mainly reed canarygrass) on the Delta to grow tall and thick. In addition, the blackberries have also started to spread and become more dense. Noxious weeds would continue to be controlled by the use of biological controls, but no control of invasive, non-native species (reed canarygrass and himalayan blackberry) would occur. The site would be dominated by invasive species for decades. This could lead to the exclusion of native species from competition for suitable growing conditions, and an overall reduction in plant diversity.

Biological agents include predators, pathogens, competitors, or parasites of the target species. The objective is to introduce and manage the natural enemies of invasive and noxious weeds thereby reducing infestations. The cinnabar moth (*Tyria jacobaeae*) is an example of a biological treatment available for controlling populations of tansy ragwort. The continued use of biologic agents is not expected to adversely affect soil or water quality (as discussed in the Site Contamination, Soils and Geology, and the Hydrology sections). Since there are no effective biological controls for some noxious weeds (bull thistle), other methods would have to be adopted, possibly including hand weeding or spot burning individual plants.

### ***Wildlife***

There has been a decline in waterfowl use of the site since the removal of cattle. Waterfowl forage on the small, new grass shoots. When grass is allowed to grow tall, waterfowl have a difficult time foraging on the new growth. Waterfowl use of the old Sandy River Channel Slough and the wetland adjacent to I-84 could be expected to continue under this alternative.

Existing and continued dispersed and unregulated recreation activities such as hiking, horseback riding, mountain bike riding, dogs, fishing, hunting, and camping is not expected to cause a change in wildlife usage. Wildlife usage is expected to remain the same under this alternative. As the site begins regeneration and moves towards a forested climax, there would be a shift in wildlife species from those that utilize more open and edge habitats -- such as red-tailed hawks, mice, rabbits, and waterfowl-- to those that inhabit forested habitats -- such as bats, voles, woodpeckers, owls, and deer.

To effectively manage mosquitoes, Multnomah County will continue to treat the 64 acres they are currently treating by: (1) monitoring mosquito production, and (2) applying various formulations of both Bti and methoprene to breeding areas when needed for control. No additional areas will be treated. Existing farm roads and informal trails will be used to access breeding areas and transport control materials and equipment. This proposed mosquito control plan would be a beneficial effect, by reducing disease carrying organisms without reducing larvae which are the food supply for fish and herptiles.

### ***Fish***

Fisheries resources on and adjacent to the site are expected to remain the same and would not be affected by this alternative.

### ***Sensitive, Threatened, and Endangered Species***

This alternative is not expected to have an adverse effect on any STE species. Existing recreational activities are not expected to cause a change in STE wildlife species currently using the area.



### *Migratory Species*

Removal of grazing cattle in 1992 has allowed grasses and shrubs to grow up and substantially cut water fowl usage. The gradual reforestation of the site would further reduce its usefulness to migrating waterfowl. The same reforestation would improve shallow water habitat for migrating salmonids.

#### **4.4.3 Alternative 2**

### *Landscape Pattern*

Alternative 2 contains the greatest diversity of habitat types of the four action alternatives. This alternative would reforest Sun Dial Island and have a variety of different types of habitats highly interspersed on the Thousand Acres. The diverse habitat interspersion is expected to attract the highest variety of wildlife species. This landscape pattern would enhance forested riparian dependent species, edge dependent species, waterfowl, amphibians, and reptiles.

The folded diamond interchange would allow for the preservation of most of the oak trees in the ODOT triangle south of I-84, but would result in the removal of a few oaks north of I-84. The area of oaks in the ODOT triangle would be restored to create an oak savannah. Oak savannahs are endemic to the Willamette Valley and in the Gorge. The Sandy River Delta is on the westernmost end of the savannah range in the Gorge. Enhancement of this savannah would restore this currently degraded area.

Widening of I-84 would impact approximately 2 acres of palustrine emergent wetlands and approximately 1 acre of forested wetland on the Thousand Acres subarea. These fills meet the NSA Management Plan exception. There would be minor wetlands impacts with construction of trails. The proposed trail through the wet meadow on the Thousand Acres would be a boardwalk. In order to reduce impacts of construction of the fishery parking, pervious surfaces on trails and parking are proposed. Filling of wetlands would be mitigated by creation of wetland areas on National Forest land on the Delta. The wetland creation would be coordinated with DSL and ACOE during the Joint Wetland Removal/Fill Permit process, and the mitigation would be incorporated as part of the landscape pattern.

### *Vegetation Management*

Alternative 2 would maintain a large area of upland meadow, which would require the conversion from an existing plant association -- dominated by invasive and noxious species -- to a more desirable native plant species association. Herbicide use (specifically Rodeo) is proposed for this alternative to establish initial control, but not as a long-term management tool. None of the other herbicides with the same active ingredient (glyphosate) found in Rodeo is considered because Rodeo is specifically labelled for use in and around aquatic sites. The others are not. Other initial measures include manual removal of unwanted vegetation

(particularly noxious weeds); mechanical treatments such as grading reed canarygrass and mowing or grubbing out blackberries and reed canarygrass; prescribed fire in proposed meadow areas; and flooding of the proposed wetland and open water area on the Thousand Acres.

Once initial grading or mowing has occurred, an application of a herbicide is proposed to reduce unwanted vegetation below the defined threshold level (5 percent areal coverage). Herbicide treatments include the tractor drawn, or hand application of a chemical which kills plants by disrupting growth processes. A discussion of possible adverse environmental effects of Rodeo herbicide use is found in the Site Contamination section.

Manual treatments are those in which hand operated tools are used to cut, clear, thin, or prune herbaceous or woody target weed species. Manual treatments are highly specific toward the target species with minimal adverse environmental effects. Soil disturbance from walking or personnel and equipment transfer would be negligible; duff layers may be disturbed in very small areas. Oil, grease, and fuels could spill or leak from power tools, however measures would be taken to protect against such incidences.

Mechanical treatments involve the use of crawler tractors or low ground pressure tractors equipped with blades or mowing attachments to cut, till or mow the undesirable plants. These treatments may involve complete removal of the plant along with the top layer of soil. The use of tractors may result in soil compaction, puddling of water, and increased erosion. Removing the top layer of soil reduces soil organic matter content and impacts nutrient cycling and long-term soil productivity. Oil, grease, and fuels could spill or leak from tractors, however measures would be taken to protect against such incidences.

Prescribed fire is the broadcast burning of material scattered over an open area. Burns may be ignited with hand held drip torches or helitorches. A mechanical pretreatment is often done in combination with a broadcast burn. All fires set on the SRD would be subject to the FS Smoke Management Plan regulations. Prescribed fires for vegetation management control are permitted on the SRD under Oregon Administrative Rules 340-23-035 (6) which states that statewide exemptions exists for open burning on forest land permitted under the forest practices Smoke Management Plan filed with the Secretary of State pursuant to ORS 477.515. Prescribed fires effect on air quality is discussed in the Air Quality section.

Prescribed fire can affect many components of the soil ecosystem: organic matter, nutrient capital and cycling, microorganisms, and erosion. Loss of organic matter affects soil fertility, stability, and water storage capacity. Some nutrients are lost as gasses during burning, and additional nutrients may leach from the ash during subsequent rainfall. Organic matter acts to cement soil particles together. When it is lost a soil is more susceptible to dislodging by rainfall and surface erosion. Soil water storage capacities are reduced with reductions in soil organic matter.

Soil organisms may be directly killed by fire, especially those in the surface organic matter. This affects detritus decomposition, nutrient cycling, and mycorrhizae relationships. Changes

in soil organisms, nutrient cycling, and soil mycorrhizae may indirectly alter plant and animal communities. However, some habitats (e.g. prairie) depend on regular fires for renewal and long-term ecosystem health.

Prescribed burning can temporarily reduce scenic quality. Reductions in air quality and visibility can adversely effect both developed and dispersed recreation. Affects to air quality from burning are discussed in the Air Quality section.

Flooding an area for vegetation management involves inundating a pre-determined area for a duration and depth sufficient to bring about the desired vegetation control. Flooding for reed canary grass control involves inundation to a minimum 76-centimeter (30-inch) depth. Flooding must extend from dormancy through at least the middle of the growing season (February 1 to mid-July). A shift from aerobic to anaerobic soil conditions affects organic matter decomposition rates, nutrient capital and cycling, and soil microorganisms populations. A plant community more tolerant of flooding would replace the existing vegetation.

In order to achieve successful vegetation control on the Thousand Acres wetland site through flooding, an additional perennial water source will have to be established and a mechanism to control drainage from the area constructed. A culvert and control gate would be built across the main drainage channel under the BPA lines, and water from the spring on Broughton Bluff which formerly served the tenant would be diverted to the area. In order to maintain water depths at 30-inches or more, a berm would have to be constructed on the north and west sides of the wetland, or the area could be graded to 30-inches.

It is unlikely that a species conversion would prevent re-infestation of non-native species and noxious weeds. Therefore, an on-going maintenance program would be necessary. On-going maintenance for this alternative would include the continued use of biological agents (insects and pathogens), manual and mechanical methods, cultural methods, flooding, and prescribed fires in certain locations. Cultural methods include the introduction of planted woody vegetation to provide competition to, and control, shade-intolerant weed species such as reed canarygrass. Under this alternative trees will be planted on Sun Dial Island, with some forested areas along the Sandy River, Columbia River, and the old Sandy River Channel slough. Tree planting will not adversely affect soil or water quality.

The wetland restoration in the southeast portion of Thousand Acres would involve regrading the canal and farm ditches to more closely recreate the pre-drainage wetland pattern. This would redistribute the water and create emergent wetlands. This system of flood channels and emergent wetlands has been partially drained by a system of ditches. Flow of water from these wetlands north to the Columbia River would be restricted by a culvert and control gate near the BPA easement. If desired, this control point would offer an opportunity to manipulate the hydrology of the area.

This alternative would create the greatest amount of wetland meadow habitat of the alternatives. This habitat type would be susceptible to re-invasion of reed canarygrass and



other weeds such as purple loosestrife (a state-listed noxious weed) (Oregon Department of Agriculture, 1994). A maintenance program should be anticipated for the foreseeable future.

### *Wildlife*

The habitat scheme proposed in this alternative would provide a collage of different habitat types suitable for a variety of wildlife species occurring presently on the site or native to the area. This alternative would provide an interspersed collection of the different habitat types found on the west side of the Gorge. The habitat scheme would maintain large amounts of edge habitats while also offering some interior forested habitat on Sun Dial Island.

Restoration and enlargement of the wetlands and the small slough in the southeast portion of Thousand Acres could greatly improve an area that already functions as important habitat for wintering and resident waterfowl, painted turtle, red-legged frogs, and a variety of other wildlife species. The scrub-shrub communities scattered along the wetland edge would provide important cover for amphibians and songbirds. In addition, upland islands that would be created in the wetlands would improve opportunities for waterfowl to nest on the site. As a result, the site could contribute significantly to habitat for migrating birds on the Pacific Flyway.

Wetlands enhancement would increase waterfowl populations using the site. Wetland enhancement and creation is outside the approach zone for the Troutdale airport. However, there may be a few airplane/waterfowl interactions. These interactions would more likely happen during the fall migration period when waterfowl populations are greater. This is not expected to be a substantial effect.

Alternative 2 has the highest density of recreation proposed. The proposed trail system, fishing access, and boat access allows more people access to most of the site. Trails would be designed to allow people the opportunity to experience the different habitat types present on the site on foot, bicycle, or horseback. This human presence may disturb wildlife, but the effect is not expected to be substantial. The disturbance level would vary depending on the species. Some species would not be affected at all, while others may be flushed as people go by, and some may avoid using the site altogether. Wildlife usage (breeding, foraging, and wintering) would be expected to decrease as the number of human site users increases. This is especially true in areas with high concentrations of people such as the gateway center and parking areas.

Expansion of the riparian forest along the Columbia River and old Sandy River Channel slough would provide habitat for nesting and perching bald eagles, osprey, great blue herons, green-backed herons, kingfishers, wood ducks, and other wildlife species that use this habitat extensively. The existing trees would provide some of the structure of a mature forest (large trees, snags, down logs) early in the reforestation process.



Alternative 2 would treat approximately 96 acres for control of mosquitoes. In addition to application of Bti and methoprene to mosquito breeding areas, other biological controls such as planting plant species that are not hosts to breeding mosquitoes, controlling water levels, and the introduction of insectivorous fish such as minnows could be used. Mosquito control would focus on areas where there is projected to be high human usage, such as along trails, the fishery parking areas, and by the gateway facility.

### ***Fish***

The lower Sandy River is heavily used for recreation (especially fishing and boating). This high level of human activity has affected the fish habitat along the Sandy River by reducing the amount of riparian vegetation and increasing erosion of streambanks. Frequent use by anglers and others trying to get access to the river has created informal trails that have removed riparian vegetation and made the bank susceptible to erosion. Under this alternative, a 25-space parking lot, boat ramp, and barrier-free fishing site would be provided along the Sandy. In addition, the trail system would provide access to both the Sandy and Columbia rivers at several locations. Providing improved trail access to the river would reduce the use of informal trails. Keeping people off the informal trails would allow riparian vegetation to become re-established and reduce streambank erosion.

Alternative 2 would reforest the banks of the Columbia and Sandy rivers and the old Sandy River Channel slough. Past agricultural activities have eliminated forested riparian vegetation on the site. A major concern for fisheries resources in the Sandy River is siltation and turbidity. Replacement of riparian vegetation would reduce erosion and siltation of streambanks and provide shading and large woody debris important for fisheries habitat. Given the size of the Sandy and Columbia rivers relative to the shoreline on the site, and the volume of water in each, reforesting the banks of the Delta would not affect the water temperature in either river.

Improvements to the Jordan Road interchange would involve widening the I-84 bridges (one in each direction) over the Sandy River. Removal of riparian vegetation could cause bank erosion and turbidity in the Sandy River. Increased sedimentation could kill incubating fish eggs by blocking the flow of oxygenated water through gravel substrates and injure fish by clogging their gills. A detailed erosion control plan would be developed and implemented to reduce sedimentation during construction. The erosion measures would reduce impacts to spawning habitat such as deposition of sediment downstream on gravel substrates. In addition, this reach of the Sandy River is not prime spawning or rearing habitat for anadromous fish. Anadromous fish in this area are primarily migrating between the Columbia and upstream spawning grounds.

To avoid excessive erosion and sedimentation in fish habitat areas, all in-stream work would be performed within the ODFW in-stream work window. The ODFW in-stream work period for the Sandy River is July 15 to August 31. Construction during this period would minimize disturbance of spawning fish and incubating eggs. The schedule would be coordinated with

the resources agencies during the permit process. Silt fences would be erected at cleared and disturbed riparian areas to prevent discharge of sediment into the stream. In addition, these areas would be revegetated. To the extent possible, building materials would be kept out of the River.

### *Sensitive, Threatened and Endangered Species*

Alternative 2 would provide beach access in two locations on Sun Dial Island. Although the access sites would be positioned away from the two Columbia cress (*Rorippa columbiae*) populations, which is a candidate 2 species, it is expected that some people would wander all over the mudflats. This could result in people walking over or picking the plants. This could have an adverse effect on these plant colonies. Signs should be placed along the shore of the Columbia near the plant colonies to inform people about the mudflat habitat and the sensitive species inhabiting it and remind them to remain on trails and not pick plants. The signs should educate people about sensitive plants.

Enhancement and restoration of the slough on the southeast portion of Thousand Acres subarea would increase habitat for several forest sensitive and federal candidate species. Wetlands on-site already function as important habitat for wintering and resident waterfowl, painted turtle, and native amphibians and reptiles, and could be suitable for the introduction of the northwestern pond turtle. Along with restoration efforts, though, there would need to be a removal of exotic species such as bullfrogs and small-mouthed bass that prey upon and out-compete several of the native species that inhabit sloughs and wetlands along the Columbia River. To avoid adverse impacts to desirable species, the most effective way to remove exotic species is by the use of live traps. The removal of exotic species is time consuming and often not effective in the long-term. Short-term populations of exotic species would probably decrease, but total removal of these species is unlikely.

There is a documented bald eagle nest in the study area. This pair of bald eagles attempted to nest in 1993, but were unsuccessful. Motor boats used the inlet on the east side of the site before the bald eagle nest was built. Bald eagles are tolerant of existing uses (Stalmaster, 1978), but new or increased use could cause them to avoid reproducing or abandon the nest. The habits of this pair have not been monitored and are therefore unknown. Given this, it is difficult to assess the impacts that the proposed recreational improvements and increased boat access could have on this pair, but it is unlikely to be beneficial. At best, it would be neutral and it is possible that substantial increases in noise, light, and activity would adversely affect the eagles.

Restoring forested riparian habitat along the Columbia and Sandy Rivers would improve fish habitat for migrating salmonids. Reforesting these riparian areas would improve designated critical habitat for the migrating Snake River chinook salmon and Snake River sockeye salmon. It would also improve bald eagle perching habitat.

Alternative 2 proposes to improve boat usage and boat access to the site by constructing two moorings and two access points from the beach to the top of the bank adjacent to the existing boat moorage. Steps would be constructed partially below the mean high water line.

### *Migratory Species*

The re-creation of meadow and wetland habitat on the Thousand Acres would restore and possibly increase use of the area by waterfowl. Since cattle grazing stopped in 1992, and grasses have grown up, use by migrating waterfowl has dropped substantially. However, increased waterfowl usage could conflict with planes using Troutdale Airport.

Alternative 2 will create 12 to 15 miles of trail, mostly along the Sandy and Columbia River shorelines. However, by directing visitors to improved trails, use of informal trails and the shoreline is expected to decrease with positive effects on erosion. Reforestation of the Sandy River and Sun Dial Island shoreline will improve shallow water habitat for migrating salmonids by shading the water and providing large woody debris.

#### **4.4.4 Alternative 3**

### *Landscape Pattern*

Alternative 3 has the most open landscape pattern of the three action alternatives. This alternative would intersperse different types of open habitat areas including upland and wetland meadows and open water. This alternative is most likely to benefit waterfowl, wading birds, amphibians, and reptiles, and those species that inhabit open areas such as red-tailed hawks, pheasant, fox, and a variety of insectivores.

Alternative 3 would maintain the existing band of upland forested riparian habitat along the Columbia River and the old Sandy River channel slough and the wetland forest along the Sandy on the Thousand Acres. The upland forested area of the Thousand Acres would be enhanced by removing the blackberries in the understory and replanting with native species. The remainder of the site would be open meadow or prairie.

The folded diamond interchange would allow for the preservation of oak trees in the ODOT triangle, but would remove a few oaks north of I-84 on the Delta. The area of oaks in the ODOT triangle would be restored to create an Oregon oak savannah. Enhancement of this savannah would restore this degraded area, although the wildlife usage of the savannah is not expected to be as great with this alternative (compared to Alternative 2) due to the placement of the gateway facility south of I-84 in the vicinity of the oak savannah.

Widening of I-84 would impact approximately 2 acres of palustrine emergent wetlands and approximately 1 acre of forested wetland on the Thousand Acres Subarea. Less than 1 acre of palustrine emergent wetlands would be impacted with construction of the trail system. In



order to minimize effects to wetlands, trails will be constructed of pervious surfaces or as boardwalks. Filling of these wetlands would be mitigated for by creation of wetland areas on the Delta. This alternative proposes the greatest expansion of wetland and open water on the site. The wetland creation would be coordinated with DSL and ACOE during the Joint Wetland Removal/Fill Permit process, and the mitigation would be incorporated as part of the landscape pattern.

### *Vegetation Management*

Alternative 3 would require a plant association conversion within large areas of upland meadow, and the conversion of upland meadow into wetland meadow. Achieving these types of conversions is unlikely to succeed without use of herbicides and/or long-term investments of time and labor. Of the four alternatives, this alternative would be the most difficult to achieve the desired future condition landscape pattern, and to prevent re-infestation of non-native species and noxious weeds because of the large area of meadows.

Initial measures of vegetation control include a herbicide application to kill reed canarygrass and blackberries, manual removal of unwanted vegetation, and mechanical treatments such as grading and mowing. Environmental consequences of these actions are discussed in the Vegetation Management section of Alternative 1 and 2; and the Site Contamination, the Soils and Geology, and the Hydrology sections.

Ongoing maintenance measures include grazing of upland areas by sheep, cattle or goats; manual and mechanical removal of unwanted vegetation, continued use of biological controls; cultural methods; flooding; and the use of prescribed fire and herbicide applications. Because this alternative maintains the greatest amount of open space, the effectiveness of shading (cultural method) is limited.

With the proper mix of brush, weeds and grasses, grazing can effectively control the vigor of undesirable vegetation. Grazing would effectively manage the spread of blackberries, but would not be as effective on the control of reed canarygrass. Reed canarygrass spreads through rhizomes. In areas that contain soils subject to compaction, livestock can enhance the spread of this species by breaking up the rhizomes. This is especially true of cattle. Grazing with smaller mammals would minimize this impact. The spread of undesirable species can also be caused by the recycling of seeds.

Timely project administration and experienced managers would be needed to control the duration and intensity of the grazing. This is particularly true with sheep movement and bedding. In addition, seedlings can be susceptible to browsing or trampling damage. Livestock must be strictly controlled within riparian areas or on soils subject to compaction in order to prevent damage to soil and water resources. Water sources, the extent of forage, the quality or nutritional value, access, proper fencing, and control can all be limiting factors for the feasibility of grazing as a tool.



The impacts of wetland restoration and creation of open water in the southeast portion of Thousand Acres would be similar to those of Alternative 2. Environmental consequences of manual and mechanical removal of unwanted vegetation, continued use of biological agents, flooding, cultural methods, the use of prescribed fire and repeated use of herbicides are discussed in the Vegetation Management section for Alternative 2, the Site Contamination section, the Soils and Geology section, and the Hydrology section.

### *Wildlife*

On the Thousand Acres, open water habitat would be created with upland scrub-shrub habitat along the southwest bank to improve amphibian breeding habitat. The open landscape and increased wetlands and open water would also improve wading bird and waterfowl habitat. In addition, the inverted-Y drainage ditches on the east side of the Thousand Acres would be graded to widen and flatten the banks to create emergent wet meadow. This would increase habitat for waterfowl, wading and shore birds, and small mammals.

As discussed for Alternative 2, there may be a few waterfowl/airplane interactions from enhancement and creation of wetlands on the Thousand Acres subarea.

This alternative would not provide the low elevation forested bottomland riparian habitat that other "action" alternatives would. The forested habitat provided in this alternative is limited to that existing on the Delta now which includes some forested edge habitat. As a result, species dependent on this habitat would not increase as much as under other more forested alternatives.

The proposed trail system would increase access along the Sandy River on Sun Dial Island and along the old Sandy River channel slough on the northern portion of the Thousand Acres but would reduce access to the eastern side of the Delta. The proposed trails would reduce the amount of human-wildlife interaction in sensitive wildlife habitat areas. The trails would be north of the wetland enhancement area, and there is enough screening between the trail and the old Sandy River channel slough to reduce disturbance to wildlife that inhabit the slough. As discussed in Alternative 2, wildlife generally avoid areas of high human concentrations.

Mosquito control for this alternative would be the same as for Alternative 2.

### *Fish*

The proposed trail system for Alternative 3 would provide improved trail access to the Sandy and Columbia Rivers at several locations. As discussed in Alternative 2, providing improved trail access to the river would reduce the amount of informal trail use and allow riparian vegetation to become re-established and reduce streambank erosion.

Improvements to the Jordan Road interchange would involve widening the I-84 bridges over the Sandy River. The effects of these improvements are discussed under Alternative 2.

To avoid excessive erosion and sedimentation in fish habitat areas, all in-stream work would be performed within the ODFW in-stream work window for the Sandy River: July 15 to August 31.

### *Sensitive, Threatened, and Endangered Species*

Alternative 3 provides access to the Columbia River mudflats from Sun Dial Island at the far west end. Although the access site would be positioned away from the two Columbia cress populations, it is expected that some people would wander all over the mudflats. This could result in people walking over or picking these plants. Mitigation suggested for Alternative 2, such as educational signs, would also be appropriate.

As discussed for Alternative 2, enhancement and restoration of the slough and ponds would increase habitat for several forest sensitive and federal candidate species.

This landscape could support a subpopulation of the Columbian white-tailed deer. Columbian white-tailed deer are endemic to the forested riparian bottomlands of the Columbia River. Although the landscape pattern of this alternative is open, both wildlife refuges that have Columbian white-tailed deer subpopulations are agricultural in nature. The Columbian white-tailed deer recovery team claims that the Delta would be a suitable place to re-introduce a subpopulation (Kneeland, pers. comm., 1992). If this option is selected, a management plan for the deer would need to be developed to address such issues as: (1) management measures to control the interbreeding of black-tailed deer that currently reside on the site with white-tailed deer; (2) safety measures such as deer fences along I-84 to prevent vehicle-deer accidents; and (3) timing of the landscape enhancement with introduction of the deer. This plan would be developed by FS and USFWS.

### *Migratory Species*

Alternative 3 would provide the greatest amount of open water, wetland, and meadow habitat and, therefore, the most habitat benefit for migrating waterfowl. Increased use by waterfowl could conflict with the operations of airplanes using Troutdale Airport.

Alternative 3 would maintain most of the site in open habitat, so the benefits of reforestation of riparian areas (Alternatives 2,4, and 5) would not occur in this alternative. However, the reduced trail system would allow less recreational traffic along the shoreline and direct it to appropriate areas. As a result, erosion from informal use and associated sedimentation of fish habitat would be reduced.

#### 4.4.5 Alternative 4

##### *Landscape Pattern*

This alternative would reforest virtually the entire Delta except under the BPA powerlines, where shrub/scrub vegetation would be planted. Openings for ponds and wet sloughs would remain. This would restore the Delta more nearly to the type of habitat described in the Lewis and Clark journals; that is, low elevation forested riparian habitat. Along the Columbia River, this habitat has been lost due to urbanization and development, construction of the dams which flooded acres of river bottom lowlands, and conversion to other land uses such as agriculture, forest management, and recreation. The loss of forested riparian habitat is especially pronounced in the Multnomah/Clark county stretch of the Columbia River.

The diamond interchange would preserve oak trees both north and south of I-84. These oak areas would be restored to the oak savannahs that historically existed in this part of the Gorge. Enhancement of this savannah would restore the degraded area south of I-84. Wildlife usage of the savannah is not expected to be as great as under Alternative 2 due to the activities associated with Jordan Road, the parking lot, and the information kiosk.

Widening of I-84 would impact 3 acres of palustrine emergent wetlands. Less than 1 acre of wetlands would be impacted with construction of the trail system and impacts to wetlands would be minimized by using boardwalks or pervious surfaces for trails. Filling of these wetlands would be mitigated for by creation of wetland areas on the Delta. The wetland creation would be coordinated with DSL and ACOE during the Joint Wetland Removal/Fill Permit process, and the mitigation would be incorporated as part of the landscape plan.

##### *Vegetation Management*

This alternative has the greatest potential of achieving the preferred vegetation management goal of preventing future infestations. Most of the noxious weeds and invasive species currently infesting the site grow best in open habitats. Establishment of a forest or scrub-shrub canopy over as much of the Delta as quickly as possible offers the best chance for long-term reed canarygrass control. As a result, neither herbicides nor grazing are proposed in this alternative. Instead, an initial program of mowing and digging out invasive species would be used to allow trees to get established and shade out the reed canarygrass. However, Himalayan blackberry can survive in shade. Once initially removed by grubbing or grading, a careful monitoring program would need to be in place to track changes in blackberry coverage, and initiate early corrective treatment actions when and where damage thresholds are exceeded. Corrective action would be hand or mechanical control. This alternative retains the least amount of space in upland and wetland meadow, thus reducing the amount of acreage where intensive maintenance programs would be necessary to the minimum extent possible.

The wetland restoration in the southeast portion of Thousand Acres would involve regrading the canal and farm ditches to more closely recreate the pre-drainage wetland pattern as



discussed in Alternative 2. Once the hydrology was altered, trees would be planted to create forested wetland.

Environmental consequences of manual and mechanical removal of unwanted vegetation, continued use of biological agents, flooding, and cultural methods are discussed in the vegetation management section of Alternative 1 and 2, the Site Contamination section, the Soils and Geology section and the Hydrology section.

### ***Wildlife***

Reforestation of most of the pastures would restore important riparian forest and result in providing habitat for a wide variety of wildlife that require large areas of forest habitat including the bald eagle, yellow-billed cuckoo, northern pygmy owl, northern saw-whet owl, pileated woodpecker and Lewis' woodpecker. It could also provide appropriate habitat for re-establishment of a subpopulation of the Columbian white-tailed deer. Planting of trees along the sloughs and wetlands would lower the water temperatures early in the breeding season, thus giving amphibians an advantage over bullfrogs and warm water fish.

This forested riparian habitat would provide shade and habitat features along the water's edge and help control erosion of the shorelines by stabilizing the banks. The small slough on the southeast portion of the Thousand Acres subarea would be deepened and scrub-shrub habitat planted along the edge of the wetland limits to increase breeding habitat for amphibians.

The inverted-Y drainage ditches on the east side of the Thousand Acres would be graded to widen and flatten the banks to create open water and emergent wet meadow. This would increase habitat for waterfowl, wading and shore birds, and small mammals. However, the forested nature of this alternative would provide the least benefit to migratory waterfowl.

This alternative would have the least amount of human-wildlife interaction. There would be no improved trails on Sun Dial Island; the loop trail on the Thousand Acres subarea would be well south of the slough, but would provide access to the Columbia River on the east side of the site, and would avoid the wetland enhancement area. The existing boat moorage between the Thousand Acres and Flag Island would be removed also. As a result, species which avoid interaction with humans would be most likely to use the site under this alternative.

Mosquito control for this alternative would be the same as for Alternative 1, that is, treatment would be limited to biological controls over 64 acres to control *A vexans*.

### ***Fish***

The lower Sandy River is heavily used for recreation and this level of human activity has affected the fish habitat along the Sandy River by reducing the amount of riparian vegetation and increasing the erosion of streambanks. This alternative would not provide trails to access the Sandy River. The informal trails that exist would probably continue to be used.



This alternative would replace the forested riparian habitat that historically existed on the site. A major concern for fisheries resources in the Sandy River is siltation and turbidity. Replacement of riparian vegetation would reduce erosion and siltation of streambanks and provide shading and large woody debris important for fisheries habitat. This alternative would not affect the water temperature in the Sandy or Columbia rivers.

Improvements to the Jordan Road interchange would involve widening the I-84 bridges over the Sandy River would have the same impacts as discussed for Alternative 2. To avoid excessive erosion and sedimentation in fish habitat areas, all in-stream work would be performed within the ODFW in-stream work window for the Sandy River, which is July 15 to August 31.

To bring Jordan Road up to current safety standards without realigning it, the road would be widened and a retaining wall would be constructed along the Sandy River to minimize filling into the Sandy. Construction of the retaining wall could increase erosion and sedimentation of the Sandy. An erosion control plan would be implemented to avoid this.

#### ***Sensitive, Threatened, and Endangered Species***

Removal of boating activities and restoring forests along the river's edge would improve habitat conditions for the bald eagle pair nesting nearby. This alternative would not provide a trail system onto Sun Dial Island. Since there would not be direct access to the beach, there would not be adverse effects from people on the two populations of Columbia cress.

As discussed for Alternative 3, enhancement and restoration of the slough and ponds would increase habitat for several forest sensitive and federal candidate species. Reforestation of the site could provide appropriate habitat for the re-establishment of the Columbian white-tailed deer in the area.

#### ***Migratory Species***

The forested habitat in this alternative would not support large populations of migratory waterfowl although some use of ponds and sloughs would continue to occur. The major benefit would be in the restoration of riparian habitat and the associated positive effects on shallow water habitats for migrating salmonids.

### **4.4.6 Alternative 5**

#### ***Landscape Pattern***

Alternative 5 combines the open habitats proposed for the Thousand Acres in Alternative 3 with the forest and scrub-shrub habitats proposed for Sun Dial Island in Alternative 2. As a result, there would be benefits to both species that inhabit open areas, and those that rely on

riparian forests. The entire Sandy River shoreline and most of the Columbia River shoreline would be forested.

The folded diamond interchange configuration would preserve the Oregon oak grove between I-84 and the UPRR. Its habitat value would be limited because the gateway kiosk would be located in or adjacent to it.

Widening the I-84 bridges and construction of the interchange and weaving lanes would affect approximately 2 acres of palustrine emergent wetland. Less than 1 acre of wetlands will be impacted by construction of the trail system, which would use boardwalks or pervious surfaces across wetland. All wetland fills would be mitigated by creation of wetland areas on the Delta. Wetland creation would be coordinated with DSL and ACOE during the Joint Wetland Removal/Fill Permit process, and any mitigation would be incorporated in the landscape enhancement.

### ***Vegetation Management***

Control of noxious and unwanted vegetation on Sun Dial Island would rely on manual and mechanical methods, biological controls, and shading from forest and scrub-shrub plantings, as in Alternative 4.

A broader range of techniques and more ongoing management will be needed to create and maintain the open habitats proposed for the Thousand Acres. All of the techniques described in Alternative 3 (grading, herbicides, mowing, grazing, flooding, and biological controls) would be used, with similar consequences. The environmental consequences of these techniques are described in the Vegetation Management section for Alternatives 2 and 3, the Site Contamination section, the Soils and Geology section, and the Hydrology section.

### ***Wildlife***

The open water, wetlands, and meadow habitats on the Thousand Acres would support increased populations of wading birds and waterfowl, amphibians, and small mammals, as would Alternative 3. As a result, there could be increased conflicts with airplanes using Troutdale Airport.

The forest and scrub-shrub habitat proposed for Sun Dial Island would support species dependent on riparian forest, such as the bald eagle, yellow-billed cuckoo, northern pygmy owl, northern saw-whet owl, pileated woodpecker, and Lewis' woodpecker. It could also provide habitat to establish a subpopulation of Columbia white-tailed deer.

The proposed trail system would increase public access to the Sandy River, along the old Sandy River channel, and to the Columbia River. However, the increase would not be as great as under Alternative 2. Human-wildlife interaction would be channeled to specific areas away

from sensitive wetland and mudflat habitat. Moving the existing boat moorage would move human activity somewhat away from the existing bald eagle nest.

### ***Fish***

Enhancing forested areas along the river shorelines would stabilize eroding banks, and shade the shallow water habitat to keep temperatures cool for juvenile salmonids.

Although the improved trail system will increase human use of the Sandy and Columbia River shorelines, the use of informal trails, and the erosion associated with it, will decline. Mitigation for in-stream work associated with the bridge widening would be the same as Alternative 2. To avoid excessive sedimentation in fish habitat, all in-stream work would be limited to the ODFW approved work window (July 15 to August 31).

### ***Sensitive, Threatened, and Endangered Species***

Alternative 5 would move the existing boat moorage located between Flag Island and the Delta northward between Gary Island and the Delta, away from the existing bald eagle nest. A loop trail would access the Columbia River shoreline on the Delta in that area, and restrooms would be built near the trail. The benefits of moving the boat moorage away from the eagle's nest might be outweighed by increased light, noise, and disturbance associated with increased recreational use of the area.

As discussed in Alternative 2, enhancement of the old Sandy River channel and old sloughs would increase habitat for several forest-sensitive and federal candidate species. Reforesting the river shorelines and Sun Dial Island would benefit species such as the yellow-billed cuckoo. As with Alternative 3, it would be possible to establish a subpopulation of Columbia white-tailed deer. An approved management plan for the deer would be required.

### ***Migratory Species***

Alternative 5 would provide both the open water, wetland, and meadow habitat to benefit migratory waterfowl and the forested riparian habitat to benefit migrating salmonids. The moderate recreational development would balance human recreation with open space and wildlife goals of the NSA Management Plan.

#### **4.4.7 Cumulative Effects**

The cumulative impact study area with regard to biological resources for the Sandy River Delta is defined as the Lower Columbia River (from Bonneville Dam to the mouth of the Columbia River) and the NSA.

### ***Aquatic Conservation Strategy Objectives***

None of the action alternatives for the Sandy River Delta would retard or prevent attainment of the Aquatic Conservation Strategy objectives identified in the President's Plan. The FS would manage the Sandy River Delta, which is a riparian-dependent resource, to restore biological and physical processes within the range of natural variability on the site. All of the action alternatives provide an interspersed of different habitat types found on the west side of the Cascade Mountains in the Columbia River Gorge. None of the alternatives would adversely affect the functioning of the site as a floodplain, providing riparian habitat for a variety of fish and wildlife. All of the action alternatives would enhance functioning of the site through control of invasive and noxious weeds and restoration of native habitats.

### ***Army Corps of Engineers Designated Dredge Disposal Site No. 0-112***

There is an ACOE designated dredge disposal site located along the Columbia River shoreline of Sun Dial Island. The site is a low priority beach nourishment site that was last used in 1976. According to the COE, the site may be needed in the future for maintaining the navigation channel of the Columbia River along that reach. Both populations of the Columbia cress are within the dredge disposal site. Deposit of dredge material in this area could affect these populations of Columbia cress.

### ***Columbia River System Operation Review***

The Columbia System Operation Review (SOR) EIS describes alternative Columbia River flows and elevations including those below Bonneville Dam as part of alternative System Operation Strategies (SOS) currently being finalized. It was determined in the SOS analysis that the different SOS flow regimes would not create significant direct impacts in the area below the Bonneville Dam (US Bureau of Reclamation, ACOE, and Bonneville Power Administration, 1994). Although the SOR Wildlife Work Group did not examine the stretch of the Columbia along the Sandy River Delta during the screening analysis, the work group did confirm the greatest direct impact to existing wetlands and riparian vegetation in other parts of the system was from reservoir elevation changes. The implementation of SOS may result in a slight increase in the number of high flow events during the spring freshet period. This would more closely resemble historic flow patterns. For many species which reside, den, nest, and/or forage in the riparian areas impacted by implementation of SOSs, an increase in den/nest loss, reduction in foraging areas, or greater susceptibility to predation and other mortality factors can be expected (US Bureau of Reclamation, ACOE, and Bonneville Power Administration, 1994). Loss of these populations is not anticipated. These impacts are not considered significant.

Increasing Columbia River flows during the spring would increase water levels in wetlands on the Sandy Delta, and improve chances of success for proposed wetlands enhancement.



**4.4.8 Mitigation Measures**

- 4.4 - 1. In-stream work would be restricted to the ODFW window for in-water work. For the Sandy River and its tributaries, the work period is from July 15 to August 31. Coordination with ODFW about in-water work periods for this project would occur during the Joint Wetland Removal/Fill Permit process and during consultation with NMFS.
- 4.4 - 2. To the extent possible, construction equipment would be kept out of streambeds, and refueling and maintenance would take place in areas where spills and stormwater runoff are kept from entering streams and wetland areas.
- 4.4 - 3. An erosion control plan would be implemented during construction of all project elements to minimize erosion and sedimentation.
- 4.4 - 4. A retaining wall would be used in Alternative 4 along the existing Jordan Road alignment to avoid filling into the floodplain of the Sandy River. During final design, measures would be taken to minimize impacts to the floodplain and wetland areas.
- 4.4 - 5. Silt fences would be erected at cleared or disturbed riparian areas to prevent erosion and sedimentation which may cause turbidity in the Sandy River.
- 4.4 - 6. All cleared areas would be revegetated with native species.
- 4.4 - 7. Wetlands filled as part of the interchange improvements would be mitigated for by creation of new wetlands or enhancement of existing wetlands on the Delta. Wetland mitigation design and replacement:loss ratio would be coordinated with DSL and the COE as part of the Joint Removal-Fill wetland permit process. The goal of the mitigation would be to replace functions and values lost with construction of this project.
- 4.4 - 8. Placement of educational signs along the Columbia River to inform people of sensitive mudflat habitat values and species and ways to avoid damaging them.
- 4.4 - 9. All building materials needed in the Columbia River to construct the boat dock, improve Jordan Road, and widen I-84 should be kept to a minimum.

#### 4.4.9 Summary

The Sandy River Delta is a riparian-dependent resource. All of the proposed action alternatives provide an interspersed of different habitat types found on the west side of the Cascade Mountains in the Columbia River Gorge. Alternative 2 provides the most habitat diversity, with high habitat interspersed on the Thousand Acres subarea. This alternative is most likely to benefit the greatest diversity of wildlife using the site. Alternative 3 would create a more open landscape. This alternative is most likely to benefit migratory and resident waterfowl and amphibians and reptiles. Alternative 4 would reforest the site. This landscape type is most likely to benefit those species dependent upon river bottomlands and riparian areas such as the yellow-billed cuckoo. Alternative 5 combines open habitat on the Thousand Acres with forested habitat on Sun Dial Island benefitting both migratory species and forest-dependent species.

All of the action alternatives would have a beneficial effect on wildlife habitat. Although the four action alternatives have different landscape patterns, each action alternative would enhance or restore wildlife habitats typical of Columbia River bottomlands. To achieve the desired future condition (DFC) of the different landscape patterns, different vegetation management approaches would be used. The cost and length of time required to reach the DFC would depend on the type of management approach to be used and the type of habitat to be achieved. There would be a greater chance for the spread of invasive species and noxious weeds with Alternatives 2 and 3 because they would be more open and would create larger wetland areas than Alternative 4. Management of these weed species would involve use of herbicides in Alternative 2 and grazing, prescribed fire, and herbicides in Alternatives 3 and 5. Grazing as a management strategy may have adverse side effects which are discussed in the Soils and Hydrology sections. Air quality impacts of prescribed fire are discussed in Section 4.10. The effects of herbicide use are discussed in the Site Contamination section.

Improvements to the Jordan Road interchange would result in the loss of riparian habitat with the widening of the I-84 bridge over the Sandy River. The major concern with the loss of riparian habitat is possible erosion of the streambank which could cause turbidity in the Sandy River. An erosion control plan implemented during construction would prevent erosion. The disturbed areas would be revegetated after construction is completed.

Bringing the existing Jordan Road up to safety standards under Alternative 4 would require a retaining wall along the Sandy River. A retaining wall would minimize filling into the Sandy River and associated floodplain needed to bring the undercrossing up to standard. Riparian vegetation would be lost with construction of the retaining wall. However, the existing Jordan Road alignment cannot be brought up to current safety standards without the use of a retaining wall. Alternatives 2, 3, and 5 would realign and reconstruct Jordan Road away from the Sandy River, avoiding river impacts.

Wetlands would be filled by constructing the I-84 improvements and new access road. Alternative 2 would have the greatest wetland impact, and Alternative 4 the least. Wetlands

filled as part of the project would be mitigated for by creation of new wetlands or enhancement of existing wetlands on the Delta. Wetland mitigation design and replacement: loss ratios would be coordinated with DSL and COE as part of the Joint Removal/Fill Wetland Permit process.

Improving boating access and supporting facilities in Alternative 2 could have an adverse effect on the pair of bald eagles that have a nest in the area if recreational boating use increases as a result. The increased boat use could cause this pair to abandon the current nest and relocate.

Providing access to the boating moorings would include construction of steps that will be partly below the high water mark. The BA has determined that this would have no effect on juvenile salmonids. Appropriate mitigation measures have been incorporated in the project.

Habitat restoration and enhancement could provide habitat for re-introduction of the Columbian white-tailed deer. The Columbian white-tailed deer recovery team believes that the Delta would be a suitable place to re-introduce a sub-population. Alternatives 3, 4, and 5 would sustain a subpopulation. Reintroduction could adversely affect achievement of the desired landscape pattern and adversely affect views of the site from I-84 because of the necessity for a deer fence.

There are two populations of Columbia Cress (a federal candidate species) growing along the shoreline of the Columbia River off Sun Dial Island. Providing access to the Columbia River from Sun Dial Island could have an adverse impact on this species if people pick the plant or trample over it. This impact would be greatest with Alternatives 2, 3, and 5.

Wetland enhancement and restoration on the delta would have beneficial effects on sensitive amphibians and reptiles, fisheries, and waterfowl.

The Sandy Delta is located on the Pacific Flyway. Habitat for migratory birds has been lost to urban development in the Portland metropolitan area. Any of the action alternatives would enhance habitat for migratory species, but the open habitat of Alternatives 3 and 5 would offer the greatest benefit and the forested landscape pattern of Alternative 4 the least. The No Action alternative would offer limited species diversity and forage for waterfowl.

Restoring riparian habitat will improve designated critical habitat for listed salmonids.

Table 4.4-1 presents a summary of the effects on natural resources.

**TABLE 4.4-1**  
**SUMMARY OF NATURAL RESOURCES EFFECTS**

<b>EFFECTS</b>	<b>ALTERNATIVE 1</b>	<b>ALTERNATIVE 2</b>	<b>ALTERNATIVE 3</b>	<b>ALTERNATIVE 4</b>	<b>ALTERNATIVE 5</b>
How much wetland area will be filled in association with improvements to I-84?	No change from existing conditions.	Approx. 3 acres of wetland would be filled. Fill meets NSA Management Plan exception criteria.	Approx. 3 acres of wetland would be filled. Fill meets NSA Management Plan exception criteria.	Approx. 3 acres of wetland would be filled. Fill meets NSA Management Plan exception criteria.	Approx. 3 acres of wetland would be filled. Fill meets NSA Management Plan exception criteria.
How much wetland area will be filled with construction of gateway facility and associated structures (i.e. trail system, fish parking lot, etc.)	None	Minimal wetland effects due to use of boardwalk and pervious pavers. Approx. 1 acre of forested wetland would be impacted with construction of the fish parking.	Less than 1 acre of wetland would be affected. Boardwalks and pervious surfaces will be used on trails.	Less than 1 acre of wetland would be affected. Boardwalks and/or pervious pavers will be used on trails.	Less than 1 acre will be affected. Boardwalks and/or pervious pavers will be used on trails.
Noxious weed control	No change from existing methods. Noxious weed infestations may worsen.	Landscape pattern would increase the chance of invasion by other noxious weeds not currently on the Delta: purple loosestrife. All possible control methods would be used.	Landscape pattern would increase the chance of invasion by other noxious weeds not currently on the Delta: purple loosestrife. Grazing, flooding, and fire proposed.	Landscape pattern would not give the opportunity for other species to colonize the site. Landscape pattern would help prevent reinfestation of existing noxious weeds. No herbicide use, grazing, or fire proposed.	Landscape pattern would increase the chance of invasion by other noxious weeds not currently on the Delta: purple loosestrife. All possible vegetation control methods would be used.



SANDY RIVER DELTA EIS

<b>EFFECTS</b>	<b>ALTERNATIVE 1</b>	<b>ALTERNATIVE 2</b>	<b>ALTERNATIVE 3</b>	<b>ALTERNATIVE 4</b>	<b>ALTERNATIVE 5</b>
<b>What will be effects to any threatened or endangered species?</b>	No change from existing conditions.	Increased boating access along the Columbia River could adversely affect the pair of bald eagles with a nest on nearby. Construction of boat moorings and steps for beach access may affect designated critical habitat for listed salmonids, unless placed in 15 feet of water.	Habitat pattern suitable to support subpopulation of Columbian white-tailed deer. Boating use would remain the same and impacts on bald eagles would not increase.	Habitat pattern suitable to support subpopulation of Columbian white-tailed deer. Eliminating boating and improving forested riparian habitat will benefit bald eagles.	Moving boat dock will reduce effects on existing bald eagle nest.
<b>What will be effects on any wildlife sensitive species?</b>	No change from existing conditions	Habitat would be improved to support sensitive species.	Habitat would be improved to support sensitive species.	Habitat would be improved to support sensitive species.	Habitat would be improved to support sensitive species.
<b>What will be effects to habitat diversity in the Columbia River Gorge?</b>	No change from existing conditions.	Would provide diverse habitat types for a variety of wildlife species to inhabit.	Would provide open habitat diversity.	Would restore habitat to what was described in Lewis and Clark journals.	Would provide diverse habitat types for a variety of wildlife species to inhabit.
<b>Would there be an effect on any sensitive plant species?</b>	No changed from existing conditions.	Increased beach access may affect colonies of Columbia cress.	Increased beach access will not affect colonies of Columbia cress.	No beach access.	Increased beach access will not affect colonies of Columbia cress.
<b>Will there be an effect to fisheries as a result of the proposed project?</b>	No change from existing conditions.	Riparian areas along the Columbia and Sandy rivers and the slough would be reforested, improving fish habitat.	Existing forested riparian vegetation would not change.	Riparian areas along the Columbia and Sandy rivers and the slough would be reforested, improving fish habitat.	Riparian areas along the Columbia and Sandy rivers and the slough would be reforested, improving fish habitat.

<b>EFFECTS</b>	<b>ALTERNATIVE 1</b>	<b>ALTERNATIVE 2</b>	<b>ALTERNATIVE 3</b>	<b>ALTERNATIVE 4</b>	<b>ALTERNATIVE 5</b>
<b>What will be the effects on migrating species?</b>	No changes from existing conditions.	Woody riparian habitat along the Columbia and Sandy Rivers would increase. This would improve habitat for migrating fish. The majority of the Thousand Acres subarea would consist of open habitat that would provide resting and wintering habitat for migrating waterfowl.	Woody riparian habitat along the Columbia and Sandy Rivers would increase. This would improve habitat for migrating fish. The open landscape pattern will provide foraging, wintering, breeding, and resting habitat for migrating waterfowl.	Woody riparian habitat along the Columbia and Sandy Rivers would increase. This would improve habitat for migrating fish.	Woody riparian habitat along the Columbia and Sandy Rivers would increase. This would improve habitat for migrating fish. The open landscape pattern will provide foraging, wintering, breeding, and resting habitat for migrating waterfowl.
<b>What wildlife species would benefit from proposed action?</b>	Wildlife currently using the site would continue.	This landscape pattern would enhance forested riparian dependant species, edge dependent species, waterfowl, amphibians, and reptiles.	The open landscape scheme would improve habitat for waterfowl, wading birds, and amphibians. Possible conflicts between waterfowl and air planes from wetland enhancement on the Thousand Acres subarea.	This alternative would reforest the site. Forested riparian dependent species such as Columbia white-tailed deer, yellow-billed cuckoo, bald eagle, amphibians, and reptiles.	This alternative would benefit both waterfowl, wading birds, and amphibians that require open habitat; and riparian forest species such as bald eagle, yellow-billed cuckoo, and Columbia white-tailed deer.
<b>Would there be wildlife and recreation conflicts?</b>	No change from existing conditions.	Most wildlife species will avoid areas of high human concentrations, such as the gateway center, parking areas, trails, and east side, where there are boating activities.	Most wildlife will avoid areas of high human concentrations such as parking and trails. During hunting season, waterfowl populations may decrease.	During hunting season, wildlife populations may decrease. Hunting would help control black-tailed deer populations.	Most wildlife will avoid areas of high human concentrations such as parking and trails. During hunting season, waterfowl populations may decrease.

## **4.5 CULTURAL RESOURCES**

### **4.5.1 Issues and Analysis Methodology**

This section analyzes potential effects to historic and prehistoric cultural properties consequent to selection of one of the alternatives described in Chapter 2. Protection of cultural properties is guided by 36 CFR 800 "Protection of Historic and Cultural Properties" and by Sections 3 and 2 of the Scenic Area Act. While 36 CFR 800 provides for accepting adverse effects when no other alternative is practicable, the Scenic Area Act does not allow adverse effects that cannot be reduced to acceptable levels through mitigation measures.

Cultural properties must be "significant" in order to be considered in the planning process. To be significant they must meet the criteria of eligibility for listing in the National Register of Historic Places (NRHP). Non-significant properties may be identified for protection as part of the planning process, although there is no legal requirement under the National Historic Preservation Act of 1966 (as amended), or Section 4(f) of the Department of Transportation Act.

An alternative has an "effect" on a cultural property when it would alter characteristics which qualify the property for the NRHP. An undertaking is considered to have an "adverse effect" on significant cultural properties if it affects the qualities of the property that make it eligible for listing in the NRHP. These effects include:

- Physical destruction, damage, or alteration of all or part of the property;
- Isolation of the property from or alteration of the character of the property's setting when that character contributes to the property's qualifications for the National Register;
- Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting;
- Neglect of a property resulting in its deterioration or destruction; and,
- Transfer, lease, or sale of the property.

Effects of an undertaking that would otherwise be found to be adverse may be considered as being not adverse when the historic property is of value only for its potential contribution to archaeological, historical, or architectural research, and when such value can be substantially preserved through the conduct of appropriate research, and when such research is conducted in accordance with applicable professional standards and guides (36 CFR 800.9).

Five cultural resource sites were identified within the project area. These were prehistoric archaeological sites 35MU76 and 92/91-1 (an isolate), the Sandy River diversion dam, the



historic archaeological site of the Hicklin Ranch, and the ORNC/UPRR rail line and bridge across the Sandy River. The prehistoric isolate (92/91-1) and the Hicklin Ranch site are not significant resources, assessment of effects on them do not need to be considered. The diversion dam and the ORNC rail line and bridge across the Sandy have been formally evaluated and found to be significant resources. The FS has recommended that site 35MU76 is eligible for the NRHP, SHPO has concurred.

#### **4.5.2 Alternative 1 - No Action**

Under the no action alternative no special considerations would be given to cultural resources beyond those already required for the management of these resources. This does not mean, however, that deterioration or destruction through neglect is a management option for significant sites. Under present management, the historic Sandy River diversion dam would continue to slowly deteriorate, and the prehistoric archaeological site 35MU76, would continue to suffer from shoreline and wind erosion. Normal management practices may be initiated to prevent or slow down the deterioration and erosion processes. The removal of cattle from the study area has eliminated one source of damage to the prehistoric archaeological site, however, impacts from informal use of the area as a recreation site would continue to have adverse effects on the eroding archaeological deposits. The operation of the rail line and bridge would continue to be under the private management of UPRR and would not be affected by or subject to Scenic Area management.

Present adverse effects to 35MU76 and the diversion dam are inconsistent with the Scenic Area Act, and must be addressed by the FS in terms of mitigating measures available to reduce the adverse effects to acceptable levels.

#### **4.5.3 Alternative 2**

Under Alternative 2, increased recreational use of the study area could result in additional impacts to historical and prehistoric archaeological resources. A trail over the Sandy River diversion dam could result in potentially adverse effects to the structure and to the setting of the dam. These impacts could be mitigated through designing access trails which would blend in with the existing construction materials. Effects could be further mitigated through restoration of a portion of the dam and removal of encroaching vegetation from between the rocks used in its construction. Also, recreational use of the dam could incorporate interpretive signs or viewing locations.

Increased recreational use of the study area could result in additional impacts to prehistoric site 35MU76 through increased erosion, particularly along the riverbank, where it is susceptible to wave erosion, foot traffic, and unauthorized collection of artifacts. Improved boat access and restroom facilities on the east side could increase use of the shoreline and result in increased cumulative effects to site 35MU76. These effects could be mitigated through bank stabilization



or protection work in areas that are subject to erosion and that would likely see increased recreational use. Alternatively, mitigation through professional archaeological excavation could recover the scientific information from the site. The excavation could be complete removal of cultural deposits, or a partial removal combined with a stabilization regime to reduce the erosional processes to a manageable level.

The realignment of Jordan Road, which is proposed as part of Alternative 2, could effect the site of the Hicklin farmstead on the south side of the railroad tracks. The Hicklin farmstead has not been recommended as eligible to the NRHP because of the extensive disturbance to the site and low potential for resource recovery.

Crossing under the ORNC/UPRR railroad would require excavation of the historic railroad bed to create a 56-foot wide undercrossing, but would not affect the alignment of the railroad or integrity of the remainder of the line. The appearance of the area from the historic resource would also be altered, but the current development and use of the area has been altered from the historic period, when the Hicklin family homestead occupied the site of Lewis and Clark State Park. Therefore, although the realignment would affect the railroad (creating an underpass where none currently exists), it would not adversely affect its historical character or function.

#### **4.5.4 Alternative 3**

Potential effects to cultural resources would be lessened with the reduced scope of recreational development within the study area under Alternative 3. The more restricted trail system would still use the Sandy River diversion dam, and a trail to the Columbia River at the east edge of the study area would provide access for the recreational use of the shoreline which could result in increased erosion to site 35MU76. Likewise, the proposed use of grazing to control vegetation could increase erosion impacts from erosion to site 35MU76. These potential effects to the prehistoric site could be mitigated by site excavation, bank stabilization, or bank protection work designed to protect the landform which contains site 35MU57, as discussed under Alternative 2.

As with Alternative 2, potential impacts to the site of the Hicklin farmstead, ORNC, and rail line could result from the realignment of Jordan Road adjacent to the base of Broughton Bluff and across the highway and railroad corridor. However, these effects would not be considered significant or adverse.

#### **4.5.5 Alternative 4**

The limited development proposed for Alternative 4 would lessen the potential for impacts to prehistoric and historic resources within the study area. Restricted access to National Forest land north would result in fewer direct and indirect impacts to the Sandy River diversion dam

and to site 35MU76. Use of the existing Jordan Road alignment would reduce effects to the historical UPRR line. Widening of the undercrossing of the UPRR line would not affect the railroad and result in a minor change to its setting.

While adverse effects to historical resources would be avoided by this alternative, the potential for interpretation of the Sandy River diversion dam would also be lost, although interpretation could be done at a remote site, such as the gateway facility. Adverse effects to site 35MU76 from recreational use would be greatly reduced by the removal of the boat dock in the area. Erosion control measures would still be needed to protect the site from the action of the Columbia River. However, as adverse effects to cultural resources are inconsistent with the Scenic Area Act, mitigation measures must be developed for this site.

Realigning Jordan Road to parallel the railroad would cause a minor change to the appearance of the area from the historic resource, but would not alter the alignment or function of the railroad itself. The view of the road from the railroad could be buffered somewhat with landscaping. This alternative would avoid construction of a new railroad undercrossing, and, therefore, disturbance to the historic railroad bed. Since the area around the railroad has been altered from its historic use and appearance, the introduction of a road parallel to it is not considered a significant impact.

#### **4.5.6 Alternative 5**

Effects of recreational development under Alternative 5 would be similar to Alternative 3. The Sandy River diversion dam would be used by the trail system to access Sun Dial Island. Consultation with SHPO would ensure that any changes to the dam to support the trail use would have no adverse effect on its historic integrity.

Under Alternative 5, the existing boat moorage east of the Thousand Acres would be moved north approximately 0.6 miles. Trails would access the Columbia River shore near the new location and restrooms would be located nearby.

The impact of the folded diamond interchange and realignment of Jordan Road on the ORNC rail line and railroad bridge would be the same as Alternatives 2 and 3.

#### **4.5.7 Cumulative Effects**

Cumulative effects to cultural resources likely to occur from any of the proposed action alternatives would include deterioration and degradation of historical and prehistoric resources. Increased recreational use of the study area would result in continued and cumulative impacts which would have to be mitigated through maintenance of trails and facilities, enhancement through development of interpretive materials and programs, and stabilization of eroding

shorelines near and around historic properties (i.e., sites recognized as "significant" under cultural resources regulations).

Changes in flows of the Columbia River to help in the recovery of Snake River chinook and sockeye salmon runs could increase erosion on the east side of the site, and thus site 35MU76. Site stabilization would mitigate this affect.

#### **4.5.8 Mitigation Measures**

- 4.5 - 1. With Alternatives 2 and 3, use of the historical Sandy River diversion dam as a trail for access to Sun Dial Island would be designed with compatible materials to blend in with the fabric and character of the historical structure while providing some stabilization and an opportunity for historical interpretation of the structure. For example, an interpretive viewpoint could be developed near the south abutment of the dam which would provide historical information about the dam, its construction history, and its role in the development of the study area. Maintenance and stabilization of the diversion dam and the abutments would include some form of clearing of vegetation which has encroached into the structure.
- 4.5 - 2. The integrity of prehistoric site 35MU76 would be enhanced through bank protection and stabilization to cover and protect the site from continuing erosion which could be exacerbated by increased and unregulated recreational use. Alternatively, if stabilization measures fail, the site may be professionally excavated as a data-recovery effort if its loss to natural forces is deemed to be an adverse effect in consultation with the SHPO, Tribal governments, professional archaeologists and the Advisory Council on Historic Preservation.
- 4.5 - 3. The location of the Hicklin farmstead should be avoided if possible in the designs for realigned Jordan Road and trails in order to avoid or minimize impacts.
- 4.5 - 4. The area south of the railroad tracks is well suited to interpretive use, however, development and placement of the trails and road would need to be designed to assure that damage to historical values and cultural resources will be avoided, particularly the ORNC rail line and bridge.
- 4.5 - 5. Although much of the study area has been used during prehistoric and historic times, only a few of the cultural resources are available for direct viewing and interpretation. Development of the interpretive potential for the resources and traditional Native American uses of the study area

could provide educational opportunities and provide maintenance and stabilization for the cultural resources.

- 4.5 - 6. With the exception of archaeological site 35MU76, other prehistoric sites in the study area are likely to be deeply buried (such as isolate 91/92-1) and thus are not likely to be impacted by surface use of the study area. In order to avoid unanticipated impacts, construction contract documents should alert workers and require that construction activity cease if resources are uncovered until the site and its resources can be evaluated by a qualified professional.

#### **4.5.9 Summary**

Table 4.5-1 presents a summary of the effects of the alternatives on the prehistoric and historic cultural resources on the site. Alternative 1 (the No Action alternative) and Alternative 4, which minimizes recreational development on the site, would have the least effect on prehistoric and historic resources north of I-84. Alternatives 2, 3, and 5 would use the historic dam to provide trail access to Sun Dial Island. Alternative 1, which includes no interchange improvements, is the only alternative which would have no effect on the historic ORNC rail line and Sandy River bridge. Access improvements in the action alternatives would alter the railroad undercrossing and alignment of Jordan Road. Although the alternatives may affect the historic resources, mitigation measures have been identified to minimize harm.



**TABLE 4.5-1  
SUMMARY OF CULTURAL RESOURCES EFFECTS**

<i><b>EFFECTS</b></i>	<i><b>ALTERNATIVE 1</b></i>	<i><b>ALTERNATIVE 2</b></i>	<i><b>ALTERNATIVE 3</b></i>	<i><b>ALTERNATIVE 4</b></i>	<i><b>ALTERNATIVE 5</b></i>
<b>Adverse effects on archaeological site #35MU76?</b>	Would continue to erode	Potential for additional disturbance of site due to increased usage of Delta	Potential for additional disturbance of site due to increased usage of Delta	Potential for additional disturbance to site due to increased usage of Delta, but less than Alts. 2 and 3	Potential for additional disturbance of site due to increased usage of Delta
<b>Adverse effects on historic railroad?</b>	No effect	Potential disturbance due to realigned Jordan Road	Potential disturbance due to realigned Jordan Road	Minor alteration of context through realignment of Jordan Road	Potential disturbance due to realigned Jordan Road
<b>Adverse effects on Sandy River diversion dam?</b>	Diversion dam would be stabilized but no interpretive facilities would be provided	Construction of trail across diversion dam could alter structure and context	Construction of trail across diversion dam could alter structure and context	Diversion dam would be stabilized but no interpretive facilities would be provided	Construction of trail across diversion dam could alter structure and context
<b>Adverse effects on traditional cultural uses?</b>	No change and no effect	No traditional uses identified; no effect	No traditional uses identified; no effect	No traditional uses identified; no effect	No traditional uses identified; no effect

## **4.6 LAND USES AND PLANNING**

### **4.6.1 Issues and Analysis Methodology**

Significant land use issues identified during the scoping are identified in Chapter 1.4.2. The site is designated a SMA in the NSA Management Plan. Figure 3.6-1 shows the land use designations, which are contained in the NSA Management Plan for the study area. The site has been and will continue to be used for open space and recreation. As a result, land use issues are closely related to natural resource and recreation issues discussed in Section 4.4 and 4.7 respectively. The majority of the site is designated Open Space, however, approximately 200 acres in the southwest corner of the study area is designated as Public Recreation. Land use designations would not change with the implementation of any of the five alternatives. Most non-federal land in the study area would be subject to Multnomah County planning and zoning regulations implementing the NSA Management Plan. The area west of the Sandy River (I-84 right-of-way) would be subject to the City of Troutdale's regulations.

Land use effects are considered adverse if they would result in:

- Conflicts between existing and proposed uses on the site (including the Jordan Road interchange, and gateway and recreational facilities);
- Conflicts with uses at the periphery of the site or with surrounding land use plans;
- Nuisance impacts attributable to incompatible uses or activities; and,
- Conflicts with the NSA Management Plan<sup>1</sup> and the OPRD Columbia Gorge District Master Plan.
- Rendering this reach of the Sandy River ineligible for inclusion in the federal or state Wild and Scenic Rivers programs.

The no action alternative (Alternative 1) would be the only alternative that could not meet the specific requirements of the NSA Management Plan. While each of the "action" alternatives (Alternatives 2, 3, 4, and 5) would comply with land use, design and development requirements, each would provide a different approach to the implementation of Management Plan goals and policies. None of the alternatives would affect the eligibility of this section of the Sandy River for the Wild and Scenic Rivers program, because none would alter its free-flowing character or setting. The retaining wall proposed in Alternative 4 is a minor intrusion in an area of the river already altered by construction of the freeway and railroad.

#### **4.6.2 Alternative 1 - No Action**

Under this alternative, development of site improvements would not occur and there would be no foreseeable changes to current uses on the Sandy River Delta site. The western gateway would not be developed in the project area nor would any landscape enhancement or recreational improvements be made. Camping would continue to be allowed outside the RIC 4 area, with a maximum stay limitation of 14 days in any one location and a cumulative maximum stay of 28 days. The RIC 4 area is closed to camping. No fees would be charged for use of the site and FS management of the area would remain at current levels.

#### ***Existing and Proposed Land Uses***

Under this alternative, informal recreational use would continue, but no facilities would be developed on National Forest land. OPRD has indicated that recreational use in Lewis and Clark State Park is increasing. This has placed a burden on current recreational support facilities (e.g., picnic tables, garbage cans, sanitary facilities, etc.) in the park and caused conflicts between park use and the preservation of the surrounding environment.

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<sup>1</sup> The Multnomah County NSA goals and policies are compatible with the FS NSA Management Plan and thus have not been addressed separately.

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Increasing recreational demands coupled with the lack of facility improvements or formal recreational activities north of I-84 would leave Lewis and Clark State Park as the focus of recreation, though "spill over" north of the park (including the Delta) is likely as overcrowding occurs. The concentration of visitors south of I-84 without additional improvements would increase the use of undesignated frontage road parking and increase the load on park restrooms and picnic areas.

The limited recreational opportunities and the lack of development in the Delta area could minimize conflicts between human use of the site and surrounding land uses (e.g., Portland-Troutdale Airport). However, unless trails and facilities are provided, use is likely to continue to focus on the river banks and old Sandy River channel where potential for conflicts with surrounding uses would be greatest. The lack of a restrooms, trash cans, or designated trails, for instance, may allow for a more "natural" outdoor experience, however, it could also increase the concerns over refuse, sanitation, and habitat degradation throughout the area. See Sections 4.4 and 4.12 for more discussion of these issues.

The collection of special forest products (mushrooms, basket material, fire wood, etc.) for personal use or economic gain would continue unrestricted and unregulated in this alternative. This could result in the over-harvesting of certain materials. Without regulation and monitoring of these activities, over-harvesting of native plants could occur. Over-harvesting of native plants coupled with the minimal vegetation management on the site, could adversely impact the local plant community and perhaps threaten the ability of the community to recover.

### ***Land Use Plans***

**NSA Management Plan.** This alternative would not be consistent with the goals and policies of the NSA Management Plan to protect and enhance scenic, cultural, natural and recreational resources. In this alternative, no open space plan would be developed and there would be no restoration or enhancement of wetlands, open water or formerly forested areas.

This alternative would not develop a gateway facility, nor would it provide the infrastructure necessary for this area to meet the Management Plan's designation as a southwest orientation and information gateway to the Columbia River Gorge. In general, this alternative would not meet any of the goals of the NSA Recreation Development Plan for improving trails, river access, or increasing public awareness, understanding and appreciation of the scenic, natural, cultural, economic and recreational resources in the Gorge.

**OPRD Columbia Gorge District Management Plan.** This alternative would be able to meet the OPRD's primary objective to maintain current levels of recreational parking. However, it would offer no opportunity for shared parking facilities with the FS site nor would it deal with the concerns of unregulated frontage parking on Jordan Road. In addition, this alternative would not address OPRD objectives for improving river access on or near the park.



**ROD on President's Plan.** This alternative would be consistent with the management direction for riparian reserves in that it would involve no construction and remove no vegetation. However, it would not be consistent with the direction to enhance habitat diversity and restore floodplain functions.

#### **4.6.3 Alternative 2**

Alternative 2 would maximize landscape diversity, provide a gateway facility and other maintenance and recreation support facilities, and provide the greatest intensity and variety of recreational uses on National Forest land. FS management and monitoring of the area would be ongoing and would be provided on a much more extensive basis than in Alternatives 1, 3, 4, or 5.

##### ***Existing and Proposed Land Uses***

The recreational development in this alternative would meet or exceed the guidelines set in the NSA Management Plan. The only existing user group not accommodated would be hunters, because of potential conflicts with other users. Other uses would be limited to specific areas, or times to reduce conflicts. Trail connections between the portions of the site north and south of I-84 and between the 40-Mile Loop Trail and the Lower Elevation Gorge Trail would be developed. In addition, this alternative would provide most recreation opportunities for the handicapped (including a barrier-free fishing area). The proposed trail system would also provide access to BPA and NWPC transmission lines, enhancing their operations but also increasing the potential for conflicts with recreational uses.

The gateway facility would be located north of I-84 on the Delta. The facility, approximately 5,000 square feet in size, would include information and orientation facilities as well as an on-site caretaker's residence and restoration center. The gateway would be located outside the aviation easement, but within the air traffic pattern zone. The height of the facility would not interfere with airport operations. See Section 4.11 for discussion of potential noise effects.

The proposed landscape pattern would provide the greatest diversity of wildlife using the site. The planned habitat restoration on the site may increase the avian population and, as a result, conflict with planes from Troutdale airport. Flocks of birds can be a hazard for small plane operations when they cross the flight path. Single birds are not such a problem, since they can more easily see and avoid aircraft. An increase in bird populations could have an impact on planes crossing the site. This could be an issue during winter months when waterfowl populations are highest on the site (see Section 4.4).

The increased recreational opportunities, the diverse landscape and the larger gateway facility in this alternative are expected to encourage the most visitors to the site. The increase of visitors alone will increase impacts to the natural environment (see Section 4.4) and increase exposure to airport noise. Under this alternative, however, educational and recreational use of



the site would be more controlled than the no-action alternative. The gateway facility would provide information and orientation to site visitors, which would promote an understanding of natural resources and history in the Gorge. Trails and other uses would be appropriately located throughout the site to provide a clear delineation between the human and natural environment. (A more detailed discussion of recreational impacts can be found in Section 4.7.) In addition, the FS would provide extensive maintenance and ongoing monitoring of the site through the on-site caretaker and gateway staff. The staff presence and site management would control unregulated uses and reduce concerns over fire hazards, refuse, sanitation, and potential overuse of the site under this alternative.

In addition, the development of the gateway facility and the establishment of formal recreational uses throughout the site, including an established trail connecting areas north and south of I-84, would encourage the impacts associated with those uses to be distributed throughout the study area rather than concentrated near Lewis and Clark State Park and along the Sandy River where potential conflicts with adjacent uses are greatest. This would reduce the potential recreational overload south of I-84, that could be expected under Alternative 1 or Alternative 4.

With this alternative, site visitors would be required to pay user fees for all uses on National Forest lands in the Delta except for the gateway facility. Despite the positive benefits of imposing user fees, these fees would restrict the use of the site to those who can afford to pay for it. While these fees can be imposed to reflect the economic or environmental cost of an activity (i.e., fee scales can be imposed to reflect more costly recreational facilities -- boat access more than trail use, etc.) the imposition of user fees will have the greatest impact on those users who are economically disadvantaged. Further, the implementation of such fees in the FS portion of the Delta could shift some activity from designated recreational areas to other natural areas in the site or along the Gorge that are not currently monitored and may be less appropriate for (i.e., more sensitive to) human interaction and recreational use.

The collection of special forest products (mushrooms, basket material, fire wood, etc.) would be prohibited for the first three years after project implementation under this alternative. The three-year prohibition period would allow the FS to collect data on and monitor the availability of the products on the site. After this initial period, collection would be allowed, by permits, for personal use only. Permitting such uses would allow the FS to assure that over-harvesting does not occur, and that some revenues are received for these activities.

However, prohibiting the collection of these materials for economic gain could impact some home-based business in the surrounding area. Similar to a fee system, permits have the potential to shift these activities to other natural areas that are not currently monitored and may be less appropriate for material collection.

### *Land Use Plans*

**NSA Management Plan.** Alternative 2 would be consistent with the goals and policies of the NSA Management Plan. Alternative 2 would result in the development, and maintenance of a diverse landscape plan that would offer the greatest experience to the site visitors and could potentially provide the greatest variety of wildlife using the site. A gateway facility that could serve as the southwest orientation and information gateway to the Columbia River Gorge designated in the NSA Management Plan, would be developed in land designated for such development (RIC 4). Parking would not exceed SMA requirements. River access would be improved through the boat mooring, trails, and parking facilities.

**OPRD Columbia Gorge District Management Plan.** This alternative would most effectively meet the requirements of the OPRD Management Plan. It would provide the most amount of parking in the study area and would deal most directly with the concerns of unregulated parking along Jordan Road. In addition, it would provide for a variety of recreational improvements and enhance river access including a barrier-free fishing site in the Delta along the Sandy River.

**ROD on President's Plan.** Alternative 2 proposes the most recreational development of any of the action alternative. As a result, it would result in the most ground disturbance (approximately 20 acres). Most of this is associated with interchange and access road improvements. The minor increase in impervious surfaces would not affect the floodplain functions of the site.

Trails were laid out in the field to avoid removing mature trees while providing enhanced river access. Alternative 2 would enhance riparian vegetation along the old Sandy River channel and restore forest and scrub-shrub vegetation to Sun Dial Island. Enhancing riparian vegetation would improve habitat for fish and other riparian forest dependent species.

Habitat for migratory waterfowl, wading birds, and amphibians would also be enhanced by the increase in meadow and wetland habitat on the Thousand Acres. Although wildlife may avoid areas of high human usage, the proposed usage is within the range reasonable for open space and would not compromise achievement of the management directives for riparian reserve areas.

#### **4.6.4 Alternative 3**

Alternative 3 would maximize open landscapes with only moderate recreational development. User fees would be assessed for all uses on the Delta portion of the site. Camping would be allowed anywhere in FS land on the site. Collection of special forest products (mushrooms, basket materials, etc.) would not be allowed for the first three years. After the initial three-year period, the collection of special products would be allowed by permit for personal use only.

### *Land Uses*

The recreational development in this alternative would not be as extensive as those outlined for Alternative 2. However, several new recreational opportunities would be provided throughout the site including hiking and biking trails on Sun Dial Island, and Thousand Acres. There would be no horseback riding allowed on site in this alternative, eliminating an existing site use. River access for pedestrians would be improved but there would be no additional boat ramp on the Sandy River and no improvements would be made to serve the river access on the east side of the site adjacent to Gary and Flag Islands. Litter and sanitation would continue to be problems unless alternative sanitation were provided on Gary or Flag Islands, or the boat dock were removed.

Trails in the Lewis and Clark State Park and ODOT triangle area would be restored, expanded and developed to provide universal design pedestrian access between the portions of the site north and south of I-84. Trail connections to the 40-mile Loop Trail and Lower Elevation Gorge Trail would link the site to the regional system. The proposed trail system would also provide access for BPA and NWPC to their transmission lines. Since the trail system would not be as extensive as Alternative 2, the potential for conflicts between recreation and the powerlines would be reduced.

Like Alternative 2, the facilities in this alternative would be located outside the aviation easement, but within the air traffic pattern zone. The height of the facilities would not interfere with airport operations and the noise impact from the airport would be the same as in Alternative 2, though because of the gateway location south of I-84 noise impacts for visitors and workers at that facility would be less. However, noise from the highway and train operations would be greater than in Alternative 2 (see Section 4.11).

The landscape in this alternative would be dominated by open area (meadows, prairies, open water) which would maximize site use by migratory and breeding waterfowl. As mentioned in Alternative 2, flocks of migratory birds can interfere with small plane operations. Therefore the potential for impacts on the airport operations at the Troutdale Airport are greater in this alternative than they would be in Alternatives 2 or 4, where there is less avian habitat close to the flight path. (See Section 4.4 for further discussion on this issue.)

The placement of the gateway facility on the ODOT Triangle would concentrate short-term visitors to the area south of I-84. Unlike Alternative 1, however, this alternative would provide additional paved parking facilities in the area alleviating some of the concerns with unregulated parking along Jordan Road. (See Section 4.9 for a more detailed discussion of transportation and parking issues.)

In addition, in this alternative a universal design trail would provide pedestrian access and Jordan Road would provide vehicular access between the site north and south of I-84. This coupled with the parking lot, recreational infrastructure (picnic tables, sanitary facilities, trash receptacles) and designated trail system in the Delta would encourage more recreational day



use north of I-84, than in Alternative 1 or 4, but less than Alternative 2. As a result, river access would be improved and facilities provided to meet the peak demand projected by OPRD for Lewis and Clark State Park.

This alternative would also limit the variety of recreational opportunities on the site, which could mitigate the conflicts between recreational uses (see Section 4.7). In this alternative, the separation of gateway and recreational facilities north and south of I-84 could help to discourage the use of sensitive areas for recreational activities. However, in this alternative camping would be allowed anywhere on FS lands. As in Alternative 1, the lack of designated facilities for overnight visitors could increase fire, sanitation, and refuse problems, as well as provide a greater potential for habitat degradation (see Sections 4.4 and 4.12 for further discussion of these issues). Unlike Alternative 1, this alternative would have a stay limitation of 72-hours, that would discourage overuse and use of the site by the homeless for long-term shelter.

Alternative 3 would also assess user fees on the Delta. The revenue benefits and potential impacts of implementing user fees in this Alternative would be the same as in Alternative 2.

Alternative 3, like Alternative 2, would also prohibit the collection of special forest products (mushrooms, basket material, fire wood, etc.) for the first three years. After the initial three-year period, collection for personal use would be allowed though no permit would be required. The potential for over-harvesting native plants would be greater without permitting, however, the provision of an on-site caretaker and the monitoring and maintenance proposed for this alternative could help to regulate and mitigate some of the impacts associated with this activity.

The site is buffered from surrounding land uses by the Sandy and Columbia rivers and Broughton Bluff. The moderate level of recreational development proposed in this alternative will not create noise, odors, or traffic noticeable to surrounding uses. Neighbors to the south on Broughton Bluff will be affected by changes in traffic patterns during construction of interchange improvements. A construction phasing plan will minimize disruptions.

### ***Land Use Plans***

**NSA Management Plan.** This alternative would be consistent with the goals and policies of the NSA Management Plan to protect and enhance scenic, cultural, natural and recreational resources. In addition, this alternative meets the minimum requirements of the NSA Recreation Development Plan.

The landscape enhancement for this alternative maximizes views and open areas (meadows, prairies, open water) which would encourage habitat for waterfowl and herptiles enhancing wildlife viewing opportunities. This alternative would also locate development in lands designated for such uses (RIC 4). The location of the gateway facility in this alternative would facilitate its role as a southwest orientation and information gateway to the Columbia River



Gorge, as intended in the NSA Management Plan. Parking would not exceed the SMA requirements.

**OPRD Columbia Gorge District Management Plan.** This alternative would meet the requirements of the OPRD Management Plan for parking by providing an additional 75 spaces south of I-84 which could address the concerns of unregulated frontage parking off of Jordan Road and 100 spaces north of I-84. However, existing undeveloped parking would be removed by the development of the gateway. Additional river access to the Sandy River would not be provided north of I-84, except by trail.

**ROD on the President's Plan.** The moderate level of recreational development proposed will result in 18 acres of ground disturbance and 8 new acres of impervious surface. This will not have a significant effect on the habitat, water quality, or floodplain functions of the site. Proposed landscape enhancements will improve habitat for migrating birds, increasing connectivity with Steigerwald Wildlife Refuge across the Columbia River in Washington.

#### **4.6.5 Alternative 4**

Alternative 4 would restore the Delta to conditions similar to those existing at the time of early European exploration, and minimize recreational use on the site. There would be no user fees in this alternative, and camping and the collection of special forest products would not be allowed on the site.

##### ***Existing and Proposed Land Uses***

Recreational development and access to the site would be the most limited under this alternative. There would be no trails on Sun Dial Island, and the trail system in the Delta would provide only minimal public access to the Thousand Acres. Like Alternatives 2 and 3 this alternative would provide universal design pedestrian access between the portions of the site north and south of I-84. Trail use would be limited to hiking. No bicycling or equestrian use would be allowed and no additional recreational facilities or infrastructure (i.e., garbage cans, picnic tables, restrooms, etc.) would be provided north of I-84. Existing trail bike and horseback riders would have to go elsewhere.

The limited trail system north of I-84 would improve access for BPA and NWPC over existing conditions and Alternative 1, but not as much as Alternatives 2 and 3. However, there would be less potential conflict with recreational use.

In this alternative, the gateway would be an unstaffed information kiosk with 75 parking spaces located on the ODOT triangle. The facility would be visible from I-84 eastbound, which would facilitate information functions. A kiosk would be compatible with the development of a larger tourist facility in Troutdale or another location off-site.

The limited development and the forested landscaped in Alternative 4 would make this "action" alternative the most compatible with surrounding land uses, including operations at the Portland-Troutdale airport. In addition, this alternative would have fewer visitors than either Alternatives 2 or 3. Like Alternatives 2 and 3, this alternative would not effect surrounding commercial or residential land uses, except to provide better access between the study area and other surrounding areas.

The placement of the gateway facility on the ODOT triangle and the lack of visitor vehicle access to the Delta, will concentrate site use south of I-84. Unlike Alternative 1, however, Alternative 4 would provide parking and other recreational infrastructure (i.e., picnic tables, garbage cans, etc.) in this area. This would alleviate some of the concerns with unregulated parking along Jordan Road. In addition, it would provide more support for day users and recreational activities south of I-84. These improvements could mitigate some of the impacts (e.g., refuse disposal and hiking in environmentally sensitive areas) associated with the a more intense use of the site south of I-84, than were suggested in Alternative 1.

This alternative would minimize the human presence on the Delta by limiting recreational activities, restricting vehicular access, and prohibiting camping and the collection of special forest products. The existing boat dock east of the Thousand Acres would be removed. This could minimize ongoing conflicts between the natural resources and recreational uses and discourage the use of sensitive areas for recreational activities in areas north of I-84. However, the potential for unregulated uses (i.e., over-harvesting of native plants) or recreational uses in undesignated areas (informal river access or trails) would be higher in this alternative than in Alternative 2 or 3, because FS presence would be reduced. In addition, the lack of recreation infrastructure improvements on the Delta could increase the potential for sanitation and refuse concerns in the area.

### ***Land Use Plans***

**NSA Management Plans.** This alternative would be consistent with the goals and policies of the NSA Management Plan to protect and enhance scenic, cultural, natural and recreational resources and would meet the goals of the NSA Recreation Development Plan. However, the emphasis in this alternative would be on natural rather than recreational resources. The trail mileage in this alternative is closest to that envisioned in the NSA Management Plan.

Without another off-site facility, it is unlikely that the kiosk in this alternative would be able to provide more than an informal orientation and interpretation of the natural and cultural history in the Gorge.

**OPRD Columbia Gorge District Management Plan.** This alternative would meet the requirements of the OPRD Management Plan for parking by providing additional parking in the study area, including an additional 75 spaces south of I-84 that could address the concerns of unregulated frontage parking off of Jordan Road. Additional designated river access to the

Sandy River would not be provided in this alternative, though current facilities would be maintained and improved.

**ROD on the President's Plan.** Because it would minimize site disturbance and human use of the site; and enhance riparian forest habitat, this alternative would fully meet the guidelines for management of riparian reserve areas. Although open habitat for migratory waterfowl would not be enhanced as much as in other alternatives, openings in the forest, wetland, and slough would continue to provide habitat. The major emphasis would be on forest-dependent species.

#### 4.6.6 Alternative 5

Alternative 5 combines open and forested landscape with a moderate level of recreational development. The gateway functions would be served by a kiosk south of I-84. User fees would be charged for all uses north of I-84.

##### *Land Uses*

The recreational development in Alternative 5 would be similar to that proposed in Alternative 3, with the following differences:

- A trail would be constructed to access the Sandy River near the mouth of the old Sandy River channel;
- The existing boat moorage would be moved north to increase the buffer zone around the existing bald eagle nest and cultural resources;
- The spur trail along the eastern Columbia River shore would not be built in order to increase the buffer zones around the existing bald eagle's nest; and,
- Portable restroom facilities would be located on the eastern trail loop to serve both hikers and boat moorage users.

The restoration center/caretaker's residence would be the same size and located in the same place as Alternative 3. Impacts of noise from Troutdale Airport on site users would be the same as Alternative 3. While proposed development would not interfere with airport operations, the open landscape on the Thousand Acres could increase the numbers of migratory birds using the area, and therefore conflicts with planes using the airport. Bird populations are not expected to be substantially different than those present when the site was leased for agricultural uses in the 1980's. (See Section 4.4 for a discussion of this issue.)

The fishing access trail proposed in Alternative 5 would increase the number of people in and along the river downstream from the Troutdale Sewage Treatment Plant outfall. However, as

with the barrier-free fishing site in Alternative 2, the site is over a half mile downstream and well outside the mixing zone. The trail access would be for fishing, not water play or swimming. Therefore, no adverse effects are anticipated.

The site is buffered from other surrounding land uses by the Sandy and Columbia rivers and Broughton Bluff. As with Alternative 3, the moderate level of recreational development proposed in this alternative is not expected to create light, noise, traffic, or odors noticeable to surrounding uses.

### ***Land Use Plans***

**NSA Management Plan.** This alternative would be consistent with the goals and policies of the NSA Management Plan, and accommodate all of the facilities specified in the plan.

The open landscape on the Thousand Acres would enhance habitat for migratory waterfowl, wading birds, and amphibians, while the forested habitat on Sun Dial Island would provide habitat for yellow-billed cuckoo, pileated woodpeckers, and possibly Columbia white-tailed deer. Reforesting the shorelines will enhance perching habitat for bald eagles and shallow water habitat for migrating salmonids.

**OPRD Columbia Gorge District Master Plan.** Alternative 5 would provide 75 paved parking spaces south of I-84, and regulate frontage road parking along Jordan Road. However, construction of the gateway would remove the unpaved gravel lot currently used for overflow parking between I-84 and the UPRR. One hundred (100) parking spaces would be provided north of I-84, and Alternative 5 would improve access to the Sandy and Columbia rivers.

**ROD on the President's Plan.** Alternative 5 would enhance both forested and open riparian habitat, increasing the diversity of species using the site. The moderate level of recreational development will result in approximately 18 acres of ground disturbance and 8 acres of new impervious surface out of the total of over 2,500 acres. Trails and roads have been designed to minimize water quality effects and disturbance of STE species.

### **4.6.7 Cumulative Effects**

The cumulative study area for land uses would include all of the NSA and the Portland Metropolitan Area. The cumulative effects of the development of the site for recreation and open space uses would be beneficial, in terms of regional recreation demand. Any of the action alternatives would be compatible with the Metro Greenspaces program, the NSA Management Plan, and the OPRD Gorge District Master Plan.



#### 4.6.8 Mitigation Measures

- 4.6 - 1. Move or eliminate public recreational facilities from the area of typical airport operations to reduce the numbers of people exposed to potential airport-related accidents.
- 4.6 - 2. Monitor site usage and parking patterns and provide signage to direct people to appropriate areas for parking, access, and recreation.
- 4.6 - 3. Separating the gateway and recreation functions in alternatives not already proposing to do so would reduce the potential for over-use and allow better control of site usage.

#### 4.6.9 Summary

Table 4.6-1 summarizes land use impacts of the alternatives. Any of the action alternatives would be beneficial in terms of land use and recreation goals for the site. The No Action alternative (Alternative 1) would have the least effect on existing uses, because all would be allowed to continue. All of the action alternatives would limit or prohibit some existing uses of the site in order to reduce conflicts between them and between recreational uses and natural resources. Physical barriers (the Sandy and Columbia rivers and Broughton Bluff) separate the site from adjacent land uses and reduce the potential for conflicts. Alternative 2, which would focus gateway and recreational uses in the flight path of Troutdale Airport, would have the most potential conflict with surrounding uses.

**TABLE 4.6-1  
SUMMARY OF LAND USES AND PLANNING EFFECTS**

<i>EFFECTS</i>	<i>ALTERNATIVE 1</i>	<i>ALTERNATIVE 2</i>	<i>ALTERNATIVE 3</i>	<i>ALTERNATIVE 4</i>	<i>ALTERNATIVE 5</i>
<b>Consistency with adopted plans</b>	Not consistent with NSA Management plan or OPRD Gorge District plan	Meets NSA plan, OPRD plan, and President's plan guidelines	Meets NSA plan, OPRD plan, and President's plan guidelines	Meets NSA plan and President's Plan guidelines, but does not meet all OPRD plan goals	Meets NSA plan, OPRD plan, and President's plan guidelines
<b>Compatibility with adjacent uses</b>	No change from existing conditions	Increased number of people exposed to airport hazards; compatible with other surrounding uses	Increased number of people exposed to airport hazards; compatible with other surrounding uses	Compatible with surrounding uses	Increased number of people exposed to airport hazards; compatible with other surrounding uses
<b>Effects on existing informal uses</b>	No change. Potential conflicts between uses not managed	Hunting prohibited; special forest products managed	Equestrian uses prohibited; hunting restricted to specific areas and weapons; special forest products managed	Equestrian and mountain bikes prohibited; no harvesting special forest products	Equestrian uses prohibited; hunting restricted to specific areas and weapons; special forest products managed

## **4.7 RECREATION**

### **4.7.1 Issues and Analysis Methodology**

Section 1.4.2 identified a number of recreational issues to be addressed in this EIS. This section will address the degree to which the alternatives meet applicable recreation goals and objectives for the area, whether or not conflicts between recreational uses may occur, and effects on other recreational facilities in the immediate area. Effects of recreational uses on natural and cultural resources in the study area have been addressed in Sections 4.4 and 4.5, respectively. Recreational goals, policies and guidelines applicable to the study area are addressed in Sections 1.6, 3.6, and 3.7.

For the purpose of this EIS, recreation impacts are considered to be adverse if they:

- Result in not being able to meet the recreation goals and guidelines of the NSA Management Plan;
- Create a nuisance or safety hazard for other recreational uses/users;

- Result in the elimination of an existing recreational use, if there is a high demand for such use, or change the setting or experience; or
- Result in reduced access to Lewis and Clark State Park and/or the Sandy River.

#### **4.7.2 Alternative 1 - No Action**

As noted in Section 3.7, the site is currently being used for a variety of recreation including hiking, games, mountain biking, boating, photography, wildlife viewing, horseback riding, fishing, camping, and hunting. Existing farm and service roads and trails are being used for these activities. Foot trails have been worn onto the bank of the Sandy River. Hiking along the Columbia River on Sun Dial Island occurs mostly on the sandy shore (mud flats) at the water's edge.

Beneficial recreation effects of this alternative are listed below:

1. It would maintain the undeveloped state, appreciated by some users.
2. Current uses generally fall within those allowed in RIC 1, so this alternative would comply with the NSA Management Plan recreation goals for RIC 1.
3. No recreational uses would be prohibited or limited to certain areas of the site.

Potential adverse effects of this alternative would include:

1. The alternative would not fulfill the requirements of the SMA for providing a gateway center, and more river access, although it would not preclude a gateway facility or river access facility being built off-site.
2. This alternative would not manage site use to prevent site conflicts and protect resource values. Use is likely to increase due to regional population growth, intensifying current deficiencies in parking, sanitary facilities, and security and conflicts among users. (See Sections 4.9 and 4.12 regarding these topics.)
3. Since recreation use is currently unplanned and uncontrolled, there is potential for further impacts upon the natural resources of the site, especially if use significantly increases. (See Section 4.4 for further discussion of natural resources impacts.)
4. Operation and maintenance of the National Forest land for recreation purposes would continue to be difficult from the standpoints of public relations, enforcement, sanitation, and litter clean-up.

5. The no action alternative would not provide regional trail connections with the 40-Mile Loop and the Lower Elevation Gorge trails.
6. There would be no universal design trails or facilities so use of the site would be limited to the able bodied.
7. No site interpretation or education would be provided.

#### **4.7.3 Alternative 2**

Of the four, this alternative would provide the most recreation development. New facilities would include boat-in access and support facilities for camping (restrooms, trails, and stairways) at the east side of the Thousand Acres sub-area, as well as restrooms and trails on Sun Dial Island (see Figure 2.4-2). The gateway center would be located on the north side of I-84 along with parking for 225 cars, a caretaker's residence and restoration center, fishing access with 25 parking spaces, an equestrian trailhead with 25 parking spaces, and a barrier-free fishing site.

Beneficial effects of this alternative are listed below:

1. Connection would be made to the 40-Mile Loop and Lower Elevation Gorge trails utilizing "old" Jordan Road as a trail and a new pedestrian/bikepath added to the freeway bridge over the Sandy River.
2. Trails would be available for hiking, equestrians and non-motorized mountain biking. The trails would allow exploration and experiences over most portions of the site. The length of trail (12 to 15 miles), is the greatest with this alternative and would serve the largest number of recreation users of the alternatives. Generally safety improves and vandalism decreases with a greater number of responsible users on trails.
3. This alternative would provide site access and restroom facilities for users of the boat dock on the east side adjacent to Gary and Flag islands, correcting identified erosion and sanitation problems in the area.
4. Recreational needs of disabled visitors would be met in a variety of ways, including trails, picnic areas, and a barrier-free fishing site at easy, moderate, and difficult levels.
5. Location of the gateway center on the north side of the freeway would provide better proximity to the site's natural resources for educational and interpretation programs. The proposed treatment wetland would be for educational purposes



as well as sanitation. Location of a caretaker's facility in the gateway complex would increase site security.

6. The equestrian trailhead and trails would be available for use by private individuals and groups, as well as the Multnomah County Sheriff's Posse which would aid in providing security for the site.
7. The upland and wetland meadows planned for the Thousand Acres subarea would preserve distant views of Mt. Hood and the Gorge near the gateway center, from trails and from the freeway traveling eastbound into the Gorge.
8. The realignment of Jordan Road would provide more direct access to the gateway center and would remove Jordan Road as a barrier between Lewis and Clark State Park and the Sandy River.
9. The variety of landscapes that would be provided with this alternative would enhance the recreational experience.

Potential adverse effects of this alternative are listed below:

1. Locating the gateway center on the north side of the freeway, as well as providing more trail miles than identified in the NSA Management Plan could encourage usage beyond planned capacity through visual and physical association and more direct access to the site.
2. Intensive use of the site for active recreation, such as horseback riding and mountain biking could reduce the number and variety of wildlife species for those seeking wildlife viewing or photography experiences.
3. Hunting would not be allowed due to the more extensive recreational use planned for the site. It would be difficult to separate uses and maintain closure during hunting seasons. This would be considered significant because it represents the loss of an existing recreational use. (From the standpoint of other site users this would be an advantage.)
4. There is the potential for conflict among the three different types of allowed trail users, although this can be reduced through proper trail design.
5. The assessment of a user fee (except for the gateway center), could limit use of the Delta by lower income users. However, it could help to limit overuse of the Delta and thus reduce parking problems and impacts on natural resources.
6. Pets would be permitted on site only when leashed. As a result, a current use would be reduced or restricted.

#### 4.7.4 Alternative 3

Compared to Alternatives 2 and 4, this alternative would provide a moderate amount of recreation development. A restoration center and caretaker's residence would be located on the north side of the freeway. Trail loops would provide access to portions of Sun Dial Island and the Thousand Acres subarea. A moderately-sized gateway center would be located on the south side of the freeway.

Potential beneficial recreation effects of this alternative are listed below:

1. Approximately 7 to 9 miles of trails would be provided for hiking and non-motorized mountain biking, with no equestrian use permitted. This would reduce potential conflicts among users compared to Alternatives 1 and 2.
2. Proposed trails would pass through a large amount of upland meadow which would preserve views from the trails and provide for some sense of security for users and law enforcement.
3. The gateway center would be located on the south side of the freeway where it would be visible and easily accessed by most visitors entering the Gorge. The gateway could provide interpretation about the site's resources, as well as information about the NSA.
4. Realignment of Jordan Road would eliminate the road as a barrier between Lewis and Clark State Park and the Sandy River. It would also eliminate the barrier between the future gateway center and the river.
5. This alternative connects proposed trails on the Delta with 40-Mile Loop and Lower Elevation Gorge trails.
6. From the freeway, this alternative would provide the most extensive views of the site and preserve observation of distant views and vistas beyond the site due to the open habitat character. (See more discussion of views in Section 4.8).
7. Hunting would be permitted, with weapons restrictions. The stem and loop trails would provide for easier trail monitoring and closure during hunting seasons.
8. Locating most of the parking and the gateway facility south of I-84 could reduce traffic on National Forest land and, therefore, the potential for overcrowding or overuse of the site.

9. Reduced recreational use of the site and open landscape pattern could improve wildlife viewing and photography opportunities, although the variety of wildlife to be seen would not be as diverse.
10. Provision of accessible facilities at easy, moderate, and difficult levels.

Potential adverse recreation effects of this alternative are listed below:

1. The alternative would not provide restroom facilities for boat-in access and as a result, sanitation problems would continue unless carefully policed.
2. Equestrian trails would not be provided, which would eliminate a current user group. The Sheriff's Posse could still patrol the site, but corral facilities would not be available to support their patrols.
3. The presence of pets (dogs) not associated with hunting activity or hunting training may pose a safety threat to other users.
4. The assessment of a user fee for the area north of the freeway could inhibit use of the Delta. The fee would be difficult to collect and monitor due to the different ways that users could enter the Delta (e.g., from Sandy River, trail along Jordan Road, etc.).
5. Allowing hunting to continue on the site may be considered by some site visitors to conflict with other recreational uses (e.g., wildlife viewing, picnicking).
6. Even though a reduced amount of recreation facilities are proposed, parking proposed with this alternative may not accommodate future demand for use of the Delta.

#### **4.7.5 Alternative 4**

This alternative would provide less recreation development than Alternatives 2 and 3, but more than Alternative 1. Four to six miles of trail are proposed, and trail access would be limited to the Thousand Acres subarea. No parking would be provided north of I-84. This alternative would also provide the least impact to natural resources by recreation users since it limits access to certain parts of the Delta.

Potential beneficial recreation effects are listed below:

1. This alternative would provide 4 to 6 miles of trail, including a connection to the 40-Mile Loop and Lower Elevation Gorge trails.

2. User fees would not be assessed, so the site could be used by all income groups.
3. Reduced active recreational use could improve wildlife viewing and photography opportunities, as well as provide more solitude (which could be preferred by some).
4. Elimination of vehicular access to the area north of I-84 and reducing the size and prominence of the gateway facility would reduce use of the site and the chance that the site will be overused or abused.
5. Hunting would be permitted, with weapons restrictions. The stem and loop trails would provide for easier trail monitoring and closure during hunting seasons.
6. Provision of accessible facilities at easy, moderate, and difficult levels.

Potential adverse recreation effects of this alternative are listed below:

1. Trail access would not be provided to Sun Dial Island. Uncontrolled access would continue as it currently exists on service roads and river banks unless prohibited and enforced.
2. This alternative would provide the most limited access for disabled uses of all action alternatives.
3. The interchange and Jordan Road modifications would eliminate Jordan Road as a barrier between the kiosk information center and the Sandy River, but would not eliminate it from being a barrier between Lewis and Clark State Park and the river.
4. An unstaffed kiosk will provide limited welcome and orientation for first-time or infrequent visitors to the Gorge and no on-site interpretation as intended by the NSA Management Plan. Dispersal of visitors throughout the Gorge would not occur.
5. The amount of parking proposed is the least of the three "action" alternatives. Total developed parking proposed would increase by 75 spaces south of I-84, but informal or undeveloped space would be eliminated. For peak periods and for the anticipated future demand, parking proposed is likely to be inadequate.
6. This alternative would eliminate four existing uses: equestrian, mountain biking, camping, and the existing boat dock east of the Thousand Acres. Therefore, the recreational value for these existing users of the site would be reduced.



7. The forested landscape would limit long-distance views of the Delta and beyond (see Section 4.8 for a discussion of views), reducing the variety of recreational experience.
8. Security would be less than Alternatives 2, 3, and 5 because access and visibility would be limited by fewer trails and forested landscape, and there would be no on-site caretaker.
9. Support facilities at Lewis and Clark State Park (restrooms, picnic areas) would be used by Delta visitors, increasing the pressure on these facilities.

#### **4.7.6 Alternative 5**

The recreational development in this alternative would be similar to Alternative 3 except that Alternative 5 includes a spur trail to access the Sandy River near the mouth of the old Sandy River channel, moves the existing boat moorage north about 0.6 miles, and provides restrooms for hikers and boat-in users on the eastern Columbia River shore. The total trail mileage would be 7 to 9 miles and 100 parking spaces for recreation users would be provided at the restoration center north of I-84.

Potential beneficial recreation effects would be the same as Alternative 3, plus those listed below:

1. The fishing trail to the Sandy River would enhance access for this popular activity in an area already frequently used by anglers.
2. Restrooms on the loop trail to the east side of the Thousand Acres would resolve existing sanitation problems in the area.
3. Trails will offer both open (Thousand Acres) and forested (Sun Dial Island) riparian habitat experience.

Potential adverse recreation effects in this alternative would be similar to Alternative 3, except that sanitation problems associated with the boat moorage would be addressed. Since overnight camping would be prohibited north of I-84, boaters would no longer be permitted to camp on the shore of Thousand Acres or Sun Dial Island. Camping on Gary and Flag Islands would be expected to increase, creating sanitation problems on these islands and conflicts with natural resources.

#### **4.7.7 Cumulative Effects**

The cumulative impacts study area for recreation is considered to include the NSA and the Portland Metropolitan Area, including areas in all of Multnomah, Clackamas, Washington, and Clark counties. People in these counties are likely to seek day and weekend recreation close to the metropolitan area and the study area is within a relatively short driving distance to most of the metropolitan region.

All of the alternatives evaluated would have a beneficial impact on recreation region-wide and satisfy goals of the metropolitan area by preserving a large open space at its edge. Although relatively little recreation opportunity would be provided (compared to a city or county park, for example), all of the build alternatives would enhance existing recreation on site. The recreation experience would vary. People do take satisfaction in knowing that open space has been preserved and that they could experience it if they are willing to hike its trails or explore its natural areas.

Although recreational trails are provided throughout the cumulative study area, one of the biggest recreation demands that the build alternatives could fulfill would be with the provision of trails, particularly the connection of the 40-Mile Loop Trail to the Lower Elevation Gorge Trail allowing the metropolitan area hiking access to the Gorge trails. Alternatives that would prohibit certain kinds of trail uses (e.g., Alternative 3 would prohibit equestrian and Alternative 4 would prohibit both mountain biking and equestrian) could be considered cumulatively significant from a recreation standpoint.

In addition, the site has the unique potential to enhance river access for the region. Each alternative offers some river access, but Alternatives 2 and 5 would result in the most enhancement for the widest variety of uses. River access is not possible from all of the other parks in the area.

#### **4.7.8 Mitigation Measures**

- 4.7 - 1. In all action alternatives, locate trails away from the edge of the river banks to protect natural and cultural resources and eroding river banks.
- 4.7 - 2. In Alternatives 2 and 3, provide sanitation facilities on one of the islands, or on the dock.
- 4.7 - 3. Initiate an educational program and monitor site usage to reduce the likelihood of over-use and avoid the need for user fees. Impose user fees or user limits only if necessary for site preservation.
- 4.7 - 4. For Alternatives 1 and 4, increase site security by enhancing patrols of the site.

#### 4.7.9 Summary

A summary of the recreational effects of the alternatives is presented in Table 4.7-1. Each of the build alternatives would enhance recreational access to the site. Alternative 2 places the greatest emphasis on recreation and would provide the widest variety of recreational experience. Alternative 4 would limit recreational access to hiking trails, removing the existing boat dock. As a result, the site would be managed mostly for natural resource-related recreation. Alternative 5 provides additional river access, and by moving the boat moorage, mitigates adverse effects on natural and cultural resources.

**TABLE 4.7-1  
SUMMARY OF RECREATION EFFECTS**

<i>EFFECTS</i>	<i>ALTERNATIVE 1</i>	<i>ALTERNATIVE 2</i>	<i>ALTERNATIVE 3</i>	<i>ALTERNATIVE 4</i>	<i>ALTERNATIVE 5</i>
<b>Connection to regional trails?</b>	No change from existing conditions	Provides connection to regional trails	Provides connection to regional trails	Provides connection to regional trails	Provides connection to regional trails
<b>Meets goal of informing and dispersing Gorge visitors?</b>	No change from existing conditions	Provides gateway facilities per SMA but not visible to I-84, therefore, not as useful as Alternative 3	Provides gateway per SMA and easily seen and accessed from I-84	Provides minimal facilities but easily accessed from I-84	Provides minimal facilities but easily accessed from I-84
<b>Provision of on-site interpretation and recreation?</b>	No change from existing conditions	Exceeds recreation goal	Meets SMA requirements	Provides minimal facilities	Meets SMA requirements
<b>Provision of recreation access to the site?</b>	No change from existing conditions	Provides new interchange and trail access to all of site	Provides new vehicular & trail access. No equestrian access	No vehicular access to site but new interchange. No trails to Sun Dial Island. No equestrian or bike access.	Provides new vehicular & trail access. No equestrian access
<b>Impact to parking at Lewis and Clark State Park?</b>	No change from existing conditions	Provides 275 spaces north of I-84, no change south of I-84	Provides 75 paved spaces south of I-84 but eliminates undeveloped parking areas. Provides 100 spaces on Delta	No parking north of I-84. Additional 75 paved spaces south of I-84, but undeveloped parking area removed by interchange.	Provides 75 paved spaces south of I-84 but eliminates undeveloped parking areas. Provides 100 spaces on Delta
<b>Provision for river access?</b>	No change from existing conditions	Provides support facilities for boat moorage and barrier-free fishing north of I-84; provides trails	Does not provide facilities for boat dock or new fishing access; provides trails	Eliminates existing boat dock. Does not provide additional river access; provides trails	Moves boat moorage and provides support facilities. Includes fishing trail to Sandy River
<b>Provision for security?</b>	No change from existing conditions	Provides for on-site caretaker	Same as Alt. 2.	Does not provide for on-site security.	Same as Alt. 2.



## **4.8 SCENIC RESOURCES**

### **4.8.1. Issues and Analysis Methodology**

This section addresses the effects of the proposed actions on the scenic qualities of the study area. The NSA Management Plan prescribed Guidelines for Special Management Areas on pages I-42 through I-45.

1. *New developments and land uses shall be evaluated to ensure that scenic resources are not adversely affected, including cumulative effects, based on visibility from key viewing areas.*

Specifically, the study area lies within the Landscape Setting of River Bottomlands.

- (1) *New developments and land uses shall meet the Visual Quality Objective (VQO) of partial retention, except in areas designated Open Space, where they shall meet the VQO of retention. (See Table 3.8-1 for definitions of VQOs.)*

The method used to determine the achievement of the VQOs specified above is to evaluate the proposed alterations in relation to the existing landscape in terms of scale, size, extent, and the amount of contrast in form, line, color, and texture, as viewed by a casual observer from one or more of the "key viewing areas." The key viewing areas for this project were determined by the FS to be Crown Point, I-84, Washington Highway 14, the Columbia River, the Sandy River, and UPRR. This method relies primarily on professional judgement because there are no quantifiable interval measurements which can be used as thresholds.

The criteria for determining effects is the VQO achieved by the action. Failure to achieve the VQO specified in the NSA Plan is an "adverse" effect. Achievement of the specified VQO is a "neutral" effect. Achievement of a VQO higher than that specified is a "beneficial" effect.

There are five elements of the proposed actions which could have either a positive or negative impact on the scenic qualities. They are:

- Landscape Pattern
- Recreation Features
- Gateway Facility
- Parking
- Road Access/Interchange

These elements will be evaluated separately in the text.

#### 4.8.2 Alternative 1 - No Action

Under this alternative, the Sandy River Delta site would not be developed with the western gateway, nor would any landscape enhancement or recreational improvements be made. Therefore, there would not be any direct effects to the scenic qualities of the area.

##### *Indirect Effects*

The present landscape is cultural rather than natural. The property has been used for agriculture for the past 40 years. Changes to the scenic qualities would evolve slowly as natural plant succession occurs. In the short term (ten years), there may be a reduction in scenic values for on site visitors as blackberry plants takes over more of the land. Eventually, the site would become more forested in character. Such changes would be so gradual as to be imperceptible to the casual observer, even at key viewing areas.

#### 4.8.3 Alternative 2

This alternative would maximize landscape diversity.

##### *Direct Effects*

**Landscape Pattern.** Over time, the upland forest plant community would occupy nearly half of the site, compared to one-fourth now. The other half would be fairly evenly divided among shrub and meadow plant communities. Since most viewers respond positively to landscape diversity, this would be a beneficial effect.

**Recreation Features.** The construction of trails, an equestrian trailhead, a barrier-free fishing site, boating access, and picnic sites would have a negligible effect on the scenic qualities of the area.

**Gateway Facility.** A 5,000-square foot interpretive center and caretaker residence would be located approximately 2,000 feet north of I-84, at the edge of a wooded grove. It would not be visible from any of the key viewing areas.

**Parking.** The gateway facility would have parking for 225 vehicles, requiring a clearing of about 2.5 acres. It would not be visible from any of the key viewing areas.

**Road Access/Interchange.** Alternatives 2 and 3 utilize the "folded diamond" interchange design. The new interchange would provide access to both the Sandy River Delta site and to Jordan Road. Jordan Road would be realigned through Lewis and Clark State Park along the base of Broughton Bluff. The proposed new Jordan Road alignment would be below the existing ground to a depth of up to 10 feet, in order to cross under the UPRR tracks. This would require the removal of many deciduous trees now growing in the lawn area southeast

of the picnic area and toilet building. It is probable that nine sweetgums (*Liquidambar styraciflua*) varying in size from 8 to 12 inches trunk diameter at breast height (DBH), nine bigleaf maples (*Acer macrophyllum*) varying from 18 to 24 inches DBH, along with one 24-inch Oregon white oak (*Quercus garryana*) and several pin oak and black locust trees would be removed from the park lawn.

This part of the park lawn now receives little use. The centerline of the new road would be about 150 feet from the existing toilet building. The major group of Oregon white oak trees in the picnic area would not be affected. The large shade trees are a major contributor to the landscape character of the park. The removal of approximately 30 of them would be considered a negative effect for viewers within Lewis and Clark State Park. However, the impacts would be different from the pre-selected key viewing areas (see paragraph 4.8.1, above). The visual effects of re-aligning Jordan Road through the park would be visible only from the railroad, and would not be significant as seen from that area.

North of the railroad, and south of I-84, construction of the folded diamond interchange would occur in semi-open black cottonwood (*Populus trichocarpa*) forest or open grassland. These new roads would be visible from the UPRR, especially where the freeway ramps intersect the realigned Jordan Road. At that point, most of the existing tree screen along the north side of the railroad would be removed.

North of I-84, the intersection of the highway ramps and the realigned Jordan Road would require clearing right-of-way from 100 to 150 feet wide through an extensive stand of Cottonwood, varying in size from 6 to 18 inches DBH.

At the center of the new interchange, I-84 would be 9 feet higher than it now is, in order to allow the Jordan Road connection to pass underneath it. This grade change as seen from I-84 would improve views to the north for a distance of approximately 1/4 mile.

All of the new interchange facilities would be within the Scenic Area land use designation of "Public Recreation," which has a VQO of Partial Retention. To meet this VQO, the landscape alteration, although visibly evident, must not dominate over the naturally established landscape character. The landscape which would be altered by the new interchange is not the natural landscape, but a modified landscape. It is debatable whether or not the present conditions meet the VQO of Partial Retention. Shifting the Jordan Road interchange a few hundred feet to the east would not dominate the landscape to a more significant degree than the existing interchange. The change in scenic quality would not be significant. Though the tree removal within Lewis and Clark State Park is a negative effect, the new roadway would be, for the most part, below existing grade. Therefore, it is doubtful that it would dominate the park scene, and is expected to meet the VQO.

### *Indirect Effects*

No indirect effects would occur.

#### **4.8.4 Alternative 3**

This alternative would maximize open landscapes.

### *Direct Effects*

**Landscape Pattern.** Although the wetland meadow type and open water would double in size over time to about 8 percent each, the overall appearance of the Delta site would be similar to the present conditions. This would mean little or no change in scenic quality.

**Recreation Features.** The construction of hiking trails, and picnic sites would have a negligible effect on the scenic qualities of the area.

**Gateway Facility and Restoration Center.** A 1,500-square-foot gateway facility would be located south of I-84 between the Sandy River and the new interchange. It would be visible from I-84 and the UPRR. This could have a beneficial visual effect because the present visual condition of the site is not very desirable. Improving the parking, adding a new building of a design consistent with NSA design guidelines, and providing appropriate landscape design could greatly improve the visual conditions.

The restoration center and caretaker residence would be located north of I-84 in the wooded area near the interchange. It would not be visible from any of the key viewing areas.

**Parking.** The gateway facility would have parking for 75 cars in an area now used informally for fishing parking. This would be, at worst, no change, and at best, an improvement. The restoration center would have parking for 100 vehicles, which would not be visible from any of the key viewing areas.

**Road Access/Interchange.** See discussion under Section 4.8.1 for Alternative 2.

### *Indirect Effects*

No indirect effects would occur.

#### **4.8.5 Alternative 4**

This alternative would emphasize establishment of a riparian forest with limited recreation use.



### *Direct Effects*

**Landscape Pattern.** The upland forest type would gradually increase from 26 percent of the area to 58 percent. Upland shrub and wetland shrub types would also increase to 13 and 17 percent, respectively. The upland meadow type would essentially be eliminated, while wetland meadow and open water would stay at existing levels.

The transition from open meadows to woodlands would create a different landscape character on the Delta. Because it would be similar to the naturally established landscape at the time of early exploration, some would consider the changes a beneficial effect. Further, the great increase in deciduous trees in the area would mitigate the visibility of the power line towers, which are the greatest negative impact on the scenic qualities of the Delta. On the other hand, there would much less visual penetration into the site from I-84 and the railroad.

In summary, the changes in landscape pattern would be so gradual as to be imperceptible to the casual observer, even at key viewing areas. Therefore, the open space VQO of Retention would be achieved.

**Recreation Features.** The construction of hiking trails, and picnic sites would have a negligible effect on the scenic qualities of the area.

**Gateway Facility.** A small information kiosk would be located south of I-84. It would be visible from I-84 and the UPRR. Construction of the kiosk could be a beneficial effect because the present visual condition of the site is not very desirable. Improving the parking, constructing a kiosk in accordance with NSA design guidelines, and providing appropriate landscape design could greatly improve the visual conditions.

**Parking.** There would be parking for 75 cars at the gateway facility, and none north of I-84. This would create no change in scenic quality.

**Road Access/Interchange.** Jordan Road would be realigned to the north of the UPRR to connect with the new interchange. The proposed realignment would lie parallel to, and about 130 feet north of the railroad, and would be within three feet above or below the existing ground.

Clearing for the 36-foot wide roadway (including bike paths) would remove approximately ten Oregon white oak trees, varying in size from 18 to 30 inches DBH, along with several large black cottonwood trees. A 30- to 40-foot wide strip of vegetation would remain between the railroad fence line and the new Jordan Road shoulder. It is expected that as many as six of the large Oregon white oak trees in the existing grove may be left standing.

The diamond interchange ramps would occupy open meadow or semi-open black cottonwood stands. The realigned Jordan Road would cross under I-84 and intersect with the ramps in the vicinity of the old cattle pen structure, north of I-84. Clearing for highway ramps in this area

would remove several large black cottonwood trees varying in size from 6 to 36 inches, DBH. The westbound off-ramp would be mostly in open grassland.

At the center of the new interchange, I-84 would be 9 feet higher than it now is, in order to allow the Jordan Road connection to pass underneath it. This grade change as seen from I-84 would improve views to the north for a distance of approximately 1/4 mile.

All of the new interchange work would be within the Scenic Area land use designation of "Public Recreation," which has a VQO of Partial Retention. To meet this VQO, the landscape alteration, although visibly evident, must not dominate over the naturally established landscape character. The landscape which would be altered by the new interchange is not the natural landscape, but a modified landscape. It is debatable whether or not the present conditions meet the VQO of Partial Retention. Shifting the Jordan Road interchange a few hundred feet to the east on I-84 would not dominate the landscape to a more significant degree than the existing interchange. The change in scenic quality would not be significant.

### *Indirect Effects*

No indirect effects would occur.

## **4.8.6 Alternative 5**

This alternative would maintain an open landscape in the southeast adjacent to I-84 on the Thousand Acres, but reforest Sun Dial Island.

### *Direct Effects*

**Landscape Pattern.** The overall appearance of the site from I-84 and the UPRR would not change because the open landscape would be maintained. The view from the Sandy and Columbia rivers and SR14 would change slightly because the riparian zone would be reforested and the forest would include conifers as well as deciduous trees. The result would be little change in the scenic quality of the site.

**Recreation Features.** The construction of hiking trails and picnic sites would have a negligible effect on the scenic qualities of the area.

**Gateway Kiosk and Restoration Center.** The gateway kiosk located between I-84 and the UPRR would be visible from I-84, but less obtrusive than a gateway facility. Proposed landscaping and parking improvements would improve the visual condition of the area.

The restoration center would be located north of I-84 in an opening in the forest not visible from any key viewing areas.

**Parking.** The gateway kiosk parking (75 spaces) would be paved and landscaped. The area is currently gravel or bare soil. Therefore, the proposed parking would represent no change or an improvement over existing views. Restoration center parking would not be visible from any key viewing areas.

**Roadway Access/Interchange.** See discussion under Section 4.8.1 for Alternative 2.

### *Indirect Effects*

No indirect effects would occur.

## **4.8.7 Cumulative Effects**

Portions of the existing interchange ingress and egress lanes, along with the abandoned sections of Jordan Road would become bike paths in Alternatives 2, 3, and 4. The addition of the new interchange would have a cumulative visual effect, due to the total amount of paved area, and the removal of natural standing vegetation. Assuming that any paved roadway not utilized as bike or hiking paths would be obliterated and revegetated with native plants, these effects would not be considered significant.

## **4.8.8 Mitigation Measures**

- 4.8 - 1. Soils disturbed by grading, such as cut and fill slopes, would be revegetated using native plants as much as possible. If non-native plants are used they should have characteristics similar to indigenous plants. Implementation of the revegetation will be included in construction contracts let by ODOT, FS, or other agencies, to be completed within one year after completion of construction work.
- 4.8 - 2. Additional conifer and deciduous trees would be planted along the freeway and railroad line to screen any of the proposed developments from the travel corridors. Implementation will be either included in interchange construction contracts, or other highway landscape improvement projects administered by ODOT, FS, or other agencies.
- 4.8 - 3. Existing disturbed areas on the west bank of the Sandy River could be revegetated to provide visual screening of the developments to the west.
- 4.8 - 4. In widening the I-84 crossing of the Sandy River, an open bridge railing design should be used that allows for viewing of the river.
- 4.8 - 5. Where feasible, any relocated utilities would be placed underground.

- 4.8 - 6. Sign structures would be painted with non-reflective, visually subordinate colors appropriate to the NSA. Eliminate unnecessary signs. Group needed signs in clusters where feasible.
- 4.8 - 7. Structures would be painted with non-reflective, visually subordinate colors.
- 4.8 - 8. Clearing of trees within Lewis and Clark State Park, and the wooded area north of the UPRR would be minimized where feasible to build improvements to the interchange and Jordan Road.

#### **4.8.9 Summary**

The principal adverse effects of the action alternatives would result from the removal of large deciduous trees for the realignment of Jordan Road. In Alternatives 2, 3, and 5 with the folded diamond interchange design, the adverse effect would occur in Lewis and Clark State Park, which is not a key viewing area. In Alternative 4 it would occur in the wooded area north of the railroad. Alternative 4 would remove about half as many trees as Alternatives 2, 3, and 5, and the trees removed are outside the developed portion of Lewis and Clark State Park.

As viewed from the external viewpoints, i.e., Washington Highway 14, the Columbia River, Crown Point, and the Sandy River, it is expected that all proposed actions would meet the VQO of Retention within the Open Space area, and Partial Retention with the Public Recreation land use designation.

As viewed from key viewing areas within the study area, i.e., I-84, and the Sandy River, it is expected that all proposed actions would meet the VQO of Retention within the Open Space area, and Partial Retention with the Public Recreation land use designation, provided that the recommended mitigation measures are implemented.

See Table 4.8-1 for a summary of the effects on scenic resources.



**TABLE 4.8-1**  
**SUMMARY OF SCENIC RESOURCES EFFECTS\***

<i>EFFECTS</i>	<i>ALTERNATIVE 1</i>	<i>ALTERNATIVE 2</i>	<i>ALTERNATIVE 3</i>	<i>ALTERNATIVE 4</i>	<i>ALTERNATIVE 5</i>
<b>Landscape pattern effects</b>	No change from existing conditions	Increase in landscape diversity. Upland forest on half of the area	Minimal change from existing conditions. More wetland meadows and open water	Long-term shift to forested landscape. Patterns similar to landscape at time of early exploration. Fewer power towers visible.	Increase in landscape diversity. Upland forest on half of the area
<b>Clearing and construction of gateway facility and parking</b>	No change	5000 sq ft, north of I-84. Not visible from Key Viewing Areas	1500 sq ft, south of I-84. Visible from I-84. Would improve the visual conditions	Small kiosk, south of I-84. Visible from I-84. Would improve the visual conditions	Small kiosk, south of I-84. Visible from I-84. Would improve the visual conditions
<b>Clearing of large trees for new access &amp; interchange.</b>	No change from existing	Removal of 9 Sweetgum, 9 bigleaf maple, one large oak, and several Pin Oaks and Black locust trees in the Lewis & Clark State Park	Removal of 9 Sweetgum, 9 bigleaf maple, one large oak, and several Pin Oaks and Black locust trees in the Lewis & Clark State Park	Removal of 10 White Oak and several large black Cottonwood trees north of the UPRR	Removal of 9 Sweetgum, 9 bigleaf maple, one large oak, and several Pin Oaks and Black locust trees in the Lewis & Clark State Park

\* Effects are reported as being seen from "key viewing areas."

## **4.9 TRANSPORTATION/ACCESS**

### **4.9.1 Issues and Analysis Methodology**

During scoping, several potentially significant issues were identified concerning possible impacts of the proposed action in terms of traffic, circulation, and access. These issues are listed in detail in Section 1.4.2.

To address the traffic and circulation impacts of the land use alternatives/interchange options, future conditions were evaluated for each of the five alternatives. In addition, other combinations of land use alternatives and interchange configurations were also evaluated since it is possible, although not as likely, that other combinations could be selected. For example, it is possible that the folded diamond interchange could be selected along with the land use and landscape patterns in Alternative 4, or the diamond interchange could be selected along with

the land use and landscape patterns in Alternatives 1 (no action), 2, or 5. The combinations that would match land use Alternatives 2, 3, 4 or 5 with the no action interchange option are not possible because they would increase safety hazards on I-84 and in the project area, and would not meet the purpose and need of the project.

For analysis of the alternatives and interchange options, ODOT's projected 2015 traffic volumes were used as the future background traffic volumes. A seasonal variance factor was used to adjust the traffic volumes to summer peak levels. Summer traffic volumes on the I-84 corridor are 28 percent higher than the average traffic volumes.

Two types of traffic would be attracted to the land uses proposed in the action alternatives -- recreational visitors using site facilities, and gateway visitors seeking information about other sites in the Gorge. Traffic demand for these uses was determined using different methods. The land use alternatives that include a gateway facility or information kiosk would attract traffic by providing information about activities at other locations throughout the Gorge. Because visitors would be attracted to the gateway facility by freeway signing and would not generally be familiar with the site, parking availability is not likely to be an effective regulator of demand. Therefore, a multi-step process was used to derive estimates of gateway visitations based on the total number of NSA visitations and the probability that visitors would stop at the gateway facility for information about activities elsewhere in the Gorge. Recreational users would be attracted by site facilities, and would require parking to use them. Therefore, availability of parking would be an effective regulator of demand for this group.

The Engineering Narrative Report, prepared by David Evans and Associates, Inc., contains the details of the traffic demand analysis. It is on file at the Columbia River Gorge NSA office in Hood River, Oregon. The discussion below summarizes the conclusions of this analysis.

### *Gateway Traffic Demand*

Traffic demand was estimated for 1998 (the assumed first year of partial operation) and the year 2015. Using FS studies of existing visitors to the NSA, and extrapolating based on past visitation trends, it is anticipated that a total of 3.3 million people in 1998 and 3.8 million people in 2015 will visit the NSA. Using an average of 1.83 people per vehicle, that yields 2.1 million trips annually. Table 4.9-1 summarizes the directional distribution of the traveler and the estimated probability that the traveler may need NSA information.

**TABLE 4.9-1**  
**DIRECTIONAL PROBABILITY OF GATEWAY FACILITY VISITATION**

<i>DIRECTION</i>	<i>DIRECTION DISTRIBUTION</i>	<i>PROBABILITY OF INFORMATION NEED</i>	<i>VISITATION PROBABILITY</i>
WB	45%	0.20	0.090
EB	55%	0.90	0.493

In addition to the direction of travel, the type of planned activity and the prior source of information would influence whether or not NSA visitors would stop at the gateway. For example, groups visiting friends would have little need for information, whereas sightseers would have a greater need for traveler information. In addition, a staffed gateway facility would be likely to attract repeat visitors, whereas an unstaffed information kiosk, with relatively static information, would be unlikely to attract these repeat visitors. Estimates of the probability of a NSA recreational user stopping and using the gateway facility or information kiosk were made for various recreational activities. Table 4.9-2 summarizes the peak hour directional visitation estimates for a staffed gateway facility or an unstaffed information kiosk, respectively.

**TABLE 4.9-2**  
**PEAK HOURLY VOLUME OF GATEWAY FACILITY USERS**

<i>FACILITY TYPE</i>	<i>YEAR</i>	<i>PEAK HOUR DIRECTIONAL VISITATIONS (vehicles/hour)</i>	
		<i>EB</i>	<i>WB</i>
Gateway	1998	106	20
	2015	124	23
Kiosk	1998	82	15
	2015	96	18

Inbound directional traffic to the gateway facility or information kiosk was held equal to the outbound. Some traffic could take Jordan Road to the Historic Columbia River Highway. However, for simplicity and under a worst-case scenario, it was assumed that all traffic will continue on I-84.

#### ***Recreational User Traffic Demand***

Traffic generated by the on-site recreational activities was estimated by using the amount of available parking and estimates of the average duration of visitation for the various on-site activities. Available parking is defined in terms of parking spaces not occupied by gateway complex or information kiosk visitors. Restoration center visitors are estimated to stay between two and eight hours. The shorter the average length of stay, the higher the potential parking turnover and the number of potential trips. To develop a conservative estimate of the traffic capacity required, an average duration of four hours was used to estimate the number of trips generated by the center. An estimate of three hours was used for the length of stay for trail



use or fishing. Visitors to the gateway facility would stay for approximately 30 minutes while information kiosk visitors were assumed to occupy a parking space for only 15 minutes.

Under Alternative 2, site recreation activities and gateway facilities share a common parking area. Over the course of the day, the parking use is expected to be dominated by the longer term recreational activities; therefore, the trip forecasts for the site recreational uses was conservatively based on the total available parking.

Trips to use recreational facilities at the Sandy Delta would be dominated by travel from the Portland metropolitan area. It was assumed that 90 percent of the inbound site traffic would be from the west and 10 percent from the east. The outbound traffic was assumed to return in the direction it came from. Table 4.9.3 details site-generated trips for alternatives 1 through 5. Gateway facility and information kiosk volumes are not shown since these facilities are attracting traffic from I-84.

**TABLE 4.9-3**  
**2015 ON-SITE RECREATION TRIP GENERATION**

LAND USE	PARKING SPACES & LENGTH OF STAY						TOTAL GENERATED TRAFFIC	INBOUND TRAFFIC		OUTBOUND TRAFFIC	
	Equestrian Trail		Fishing Site		Restoration Center			†EB	‡WB	EB	WB
1	--	--	--	--	--	--	0	0	0	0	0
2	25 sp	3 hr	25 sp	3 hr	160 sp	4 hr	60	55	5	5	55
3	--	--	--	--	110 sp	4 hr	30	25	5	5	25
4	--	--	--	--	--	--	--	--	--	--	--
5	--	--	--	--	150 sp	4 hr	40	35	5	5	35

†Note: Eastbound (EB)

‡Note: Westbound (WB)

### ***Total Traffic Volumes (1998)***

Interim development of the SRD is anticipated to be completed by 1998. At this time, it is unknown which will be built first, the gateway facility, information kiosk, or the recreational facilities. Of these three options, the most traffic would be generated by the gateway facility (Alternative 2 or 3). Under this worst-case scenario, traffic impacts were calculated on the existing Jordan Road interchange under each proposed land use alternative. Under Alternative 3 a staffed gateway facility would produce more traffic than predicted in Alternative 4 or 5 (an



unstaffed information kiosk). The 1998 traffic impacts are shown for Alternative 4 for comparison. Alternatives 2 and 5 will have traffic affects on the Jordan Road interchange similar to Alternatives 3.

### *Total Traffic Volumes (2015)*

Table 4.9-4 provides a summary of the increased traffic volumes predicted for each of the land use alternatives completed by 2015. The inbound and outbound directional traffic is based on site trip generation and gateway facility (or information kiosk) attracted traffic. Figures 4.9-1 through 4.9-5 summarize graphically the total seasonal peak hour traffic volumes for each alternative. These volumes include SRD trip generation, gateway facility attracted traffic, and predicted background traffic for 2015.

**TABLE 4.9-4  
2015 TOTAL SITE GENERATED TRAFFIC VOLUMES**

LAND USE	SUMMER PM PEAK TRAFFIC VOLUMES				TOTAL GENERATED TRAFFIC	INBOUND		OUTBOUND	
	Gateway Complex/ Kiosk	Equestrian Trail	Fishing Site	Restoration Center		EB	WB	EB	WB
1	--	--	--	--	0	0	0	0	0
2	150	†10	10	40	210	180	30	130	80
3	150	--	--	30	180	150	30	130	50
4	115	--	--	--	115	95	20	95	20
5	115	--	--	40	155	130	20	100	50

†Note: Rounded Values

### *Traffic Condition Summary*

Future traffic conditions for 2015 were determined for the No Interchange Modification, Diamond Interchange, or Folded Diamond Interchange alternatives. Also, interim access for 1998 (on the existing Jordan Road interchange) was investigated with the completion of a gateway facility, information kiosk, or only recreation facilities.

The level of service (LOS) for a freeway weaving section is defined in terms of the weaving speed for weaving and non-weaving traffic. Addition of a third (auxiliary) lane on I-84 between the Jordan Road and Troutdale interchanges was assumed for both the diamond and folded diamond interchange options. It was also assumed that all action alternatives would



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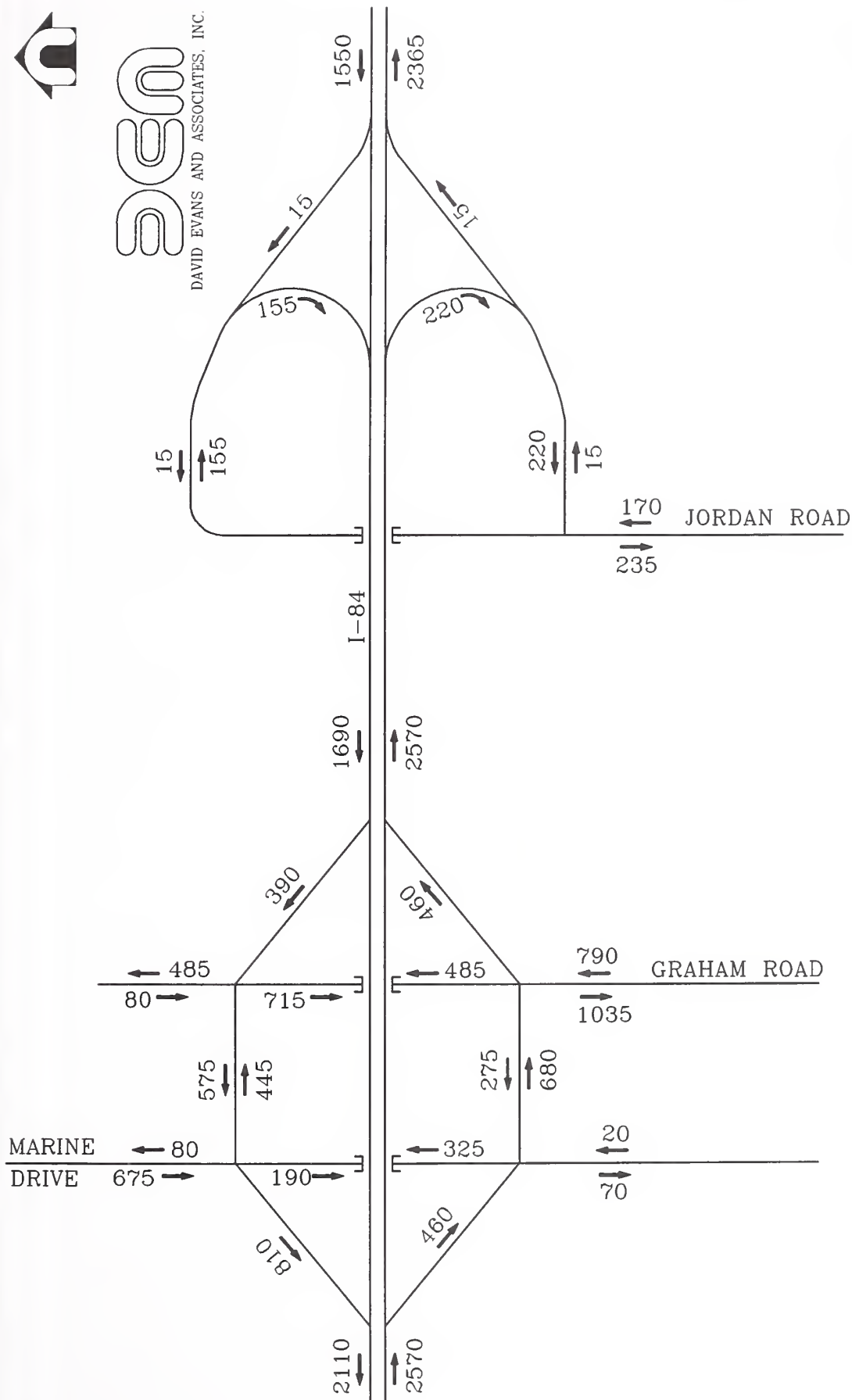


FIGURE 4.9-1  
2015 PM PEAK HOUR VOLUMES  
NO INTERCHANGE MODIFICATION 1  
ALTERNATIVE 1  
SANDY RIVER DELTA PLAN





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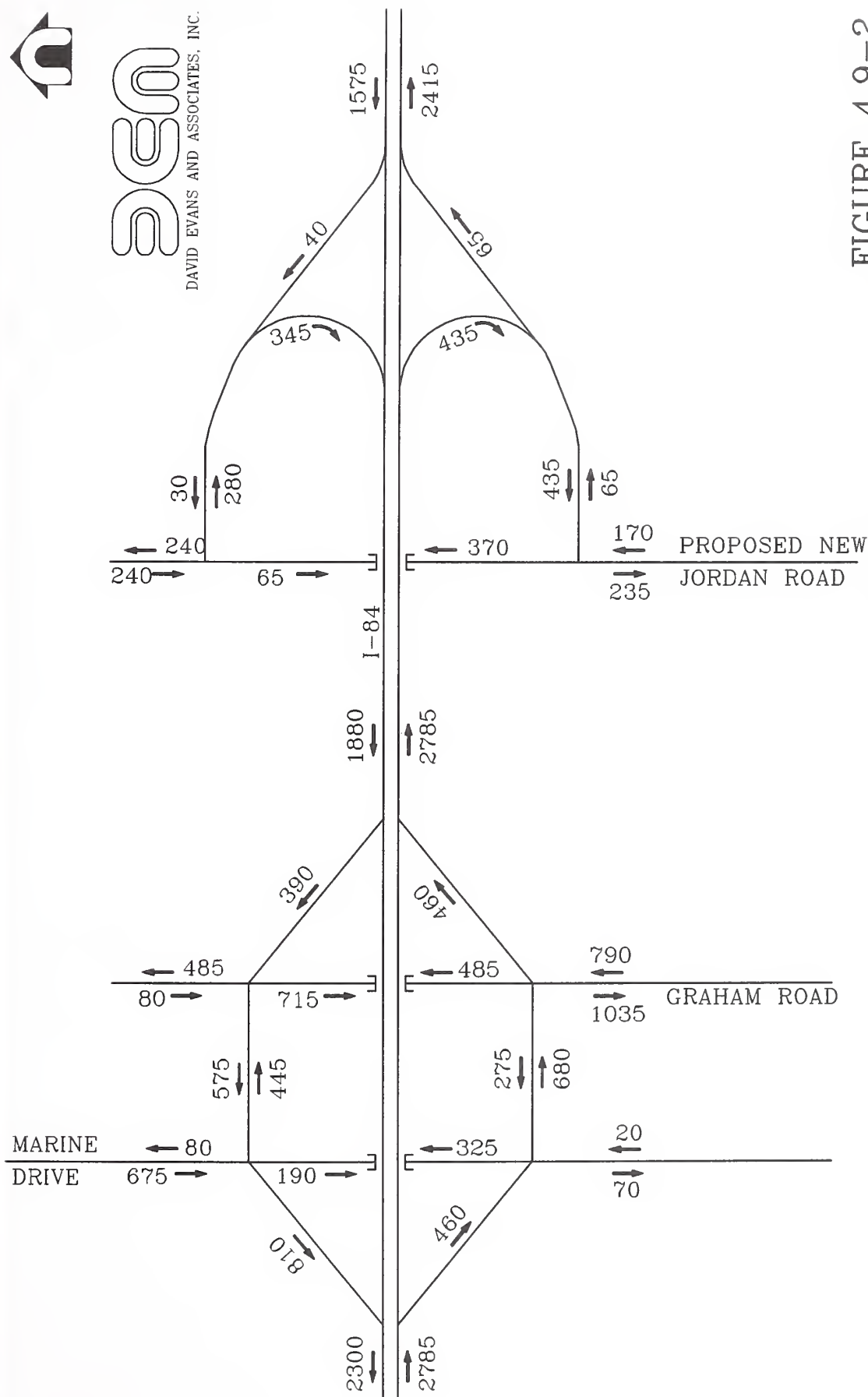


FIGURE 4.9-2  
2015 PM PEAK HOUR VOLUMES  
FOLDED DIAMOND INTERCHANGE  
ALTERNATIVE 2  
SANDY RIVER DELTA PLAN







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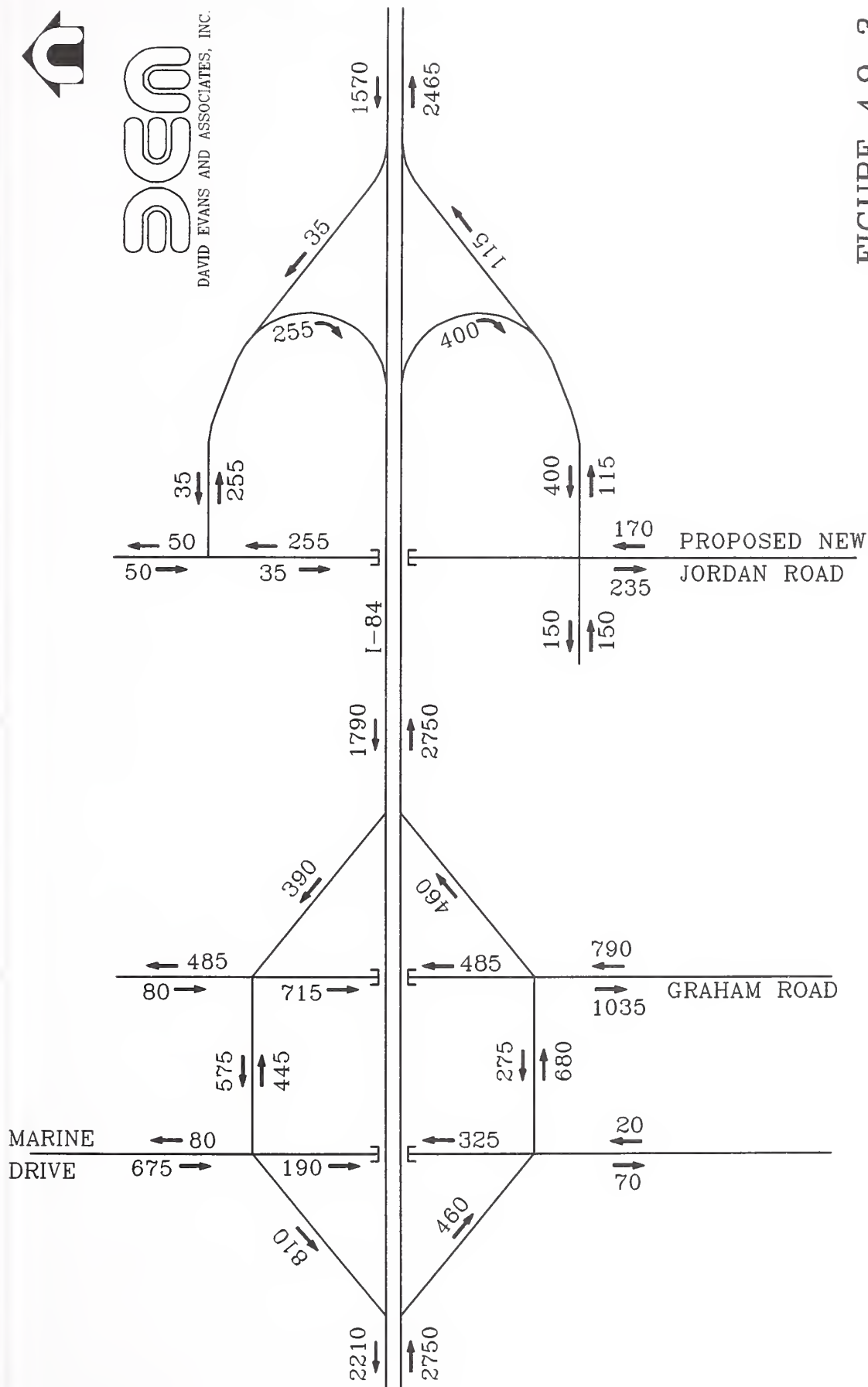


FIGURE 4.9-3  
2015 PM PEAK HOUR VOLUMES  
FOLDED DIAMOND INTERCHANGE  
ALTERNATIVE 3  
SANDY RIVER DELTA PLAN





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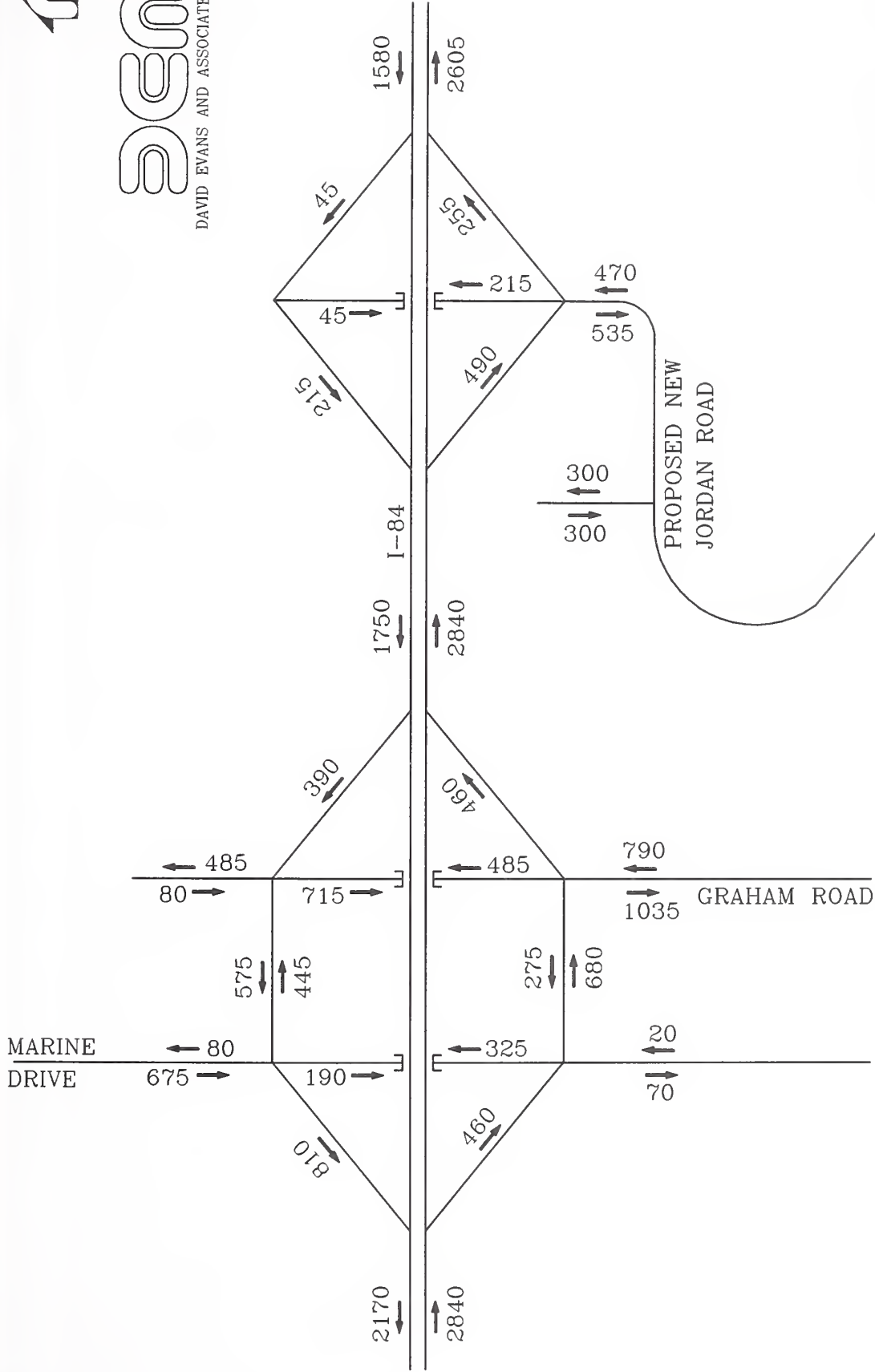


FIGURE 4.9-4  
2015 PM PEAK HOUR VOLUMES  
DIAMOND INTERCHANGE  
ALTERNATIVE 4  
SANDY RIVER DELTA PLAN







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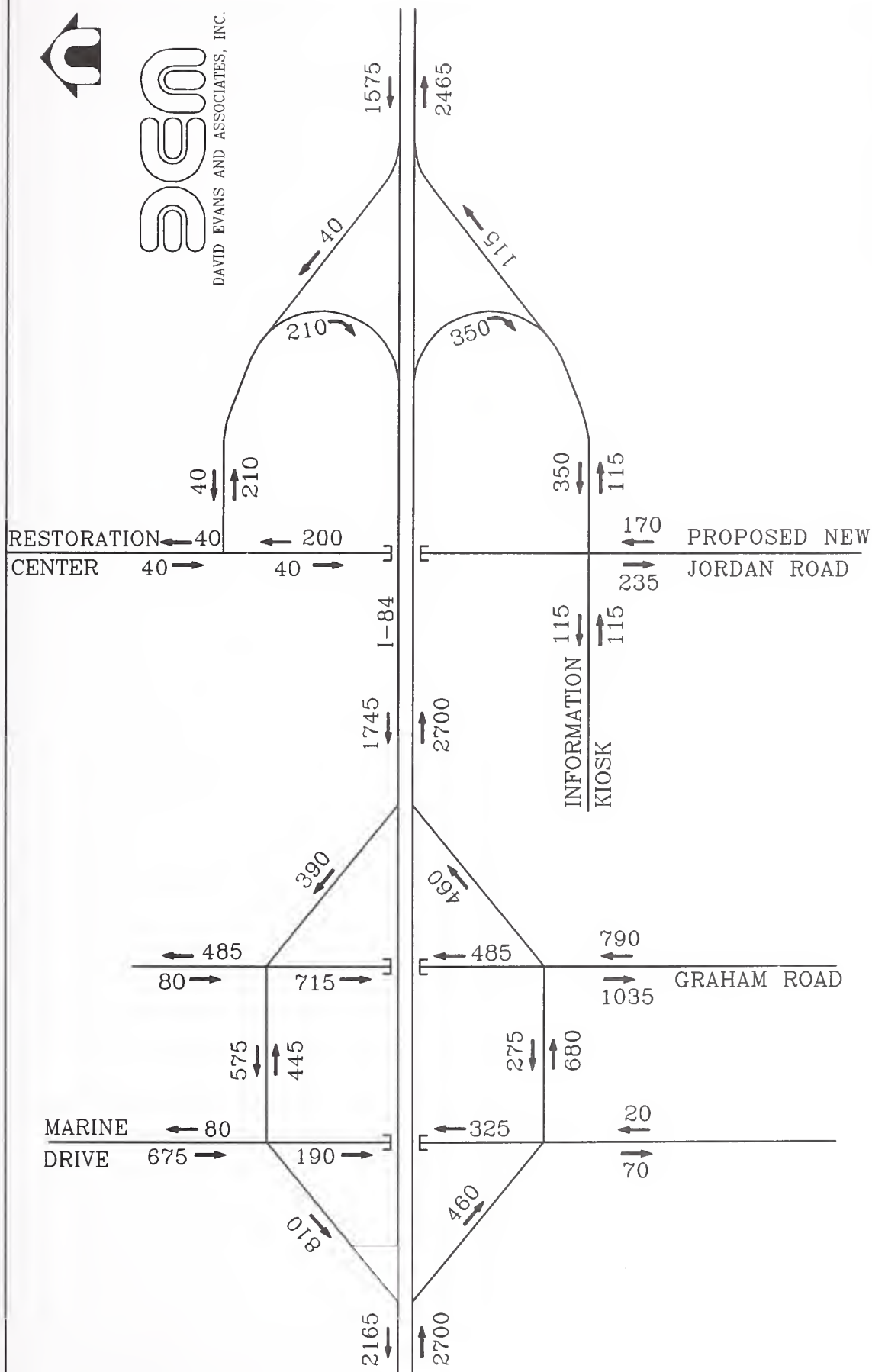


FIGURE 4.9-5  
2015 PM PEAK HOUR VOLUMES  
FOLDED DIAMOND INTERCHANGE  
ALTERNATIVE 5  
SANDY RIVER DELTA PLAN



accommodate bus traffic; and that all alternatives, including the no action alternative would maintain access to utilities.

The significance of transportation impacts depends on whether additional traffic generated by a project reduces the LOS of the affected transportation facilities to a less than acceptable level. In this case, the acceptable LOS is D or above (with LOS A the most free-flowing condition and LOS F being over-capacity).

Levels of service were estimated for the 1991, 1998, and 2015 summer PM peak hour traffic conditions. For the existing interchange, the level of service at a freeway merge or diverge point is defined based on the merge or diverge traffic flow rates. The diamond or folded diamond improvement alternatives each provide auxiliary lanes between the Troutdale and Jordan Road interchanges. With the addition of auxiliary lanes, the freeway operation analysis focuses on cars weaving into and out of the auxiliary lanes.

Using the existing interchange, level of service under each land use alternative will remain at 'B' or better through 1998. It was estimated that the level of service will drop below 'C' by 2010, due to background traffic growth and increased use of a gateway facility or information kiosk. Table 4.9-5 summarizes the levels of service for freeway and merging traffic with respect to each interchange ramp.

### ***No Interchange Modifications***

With no modifications to the current interchange configuration, an evaluation of the level of service on the freeway and merging points were made for 2015 summer PM peak hours. Under Alternative 1, levels of service do not fall below 'D'. This is especially critical at the eastbound off-ramp for the Jordan Road interchange and eastbound on-ramp for the Troutdale interchange. By 2015, under alternatives 2, 3, 4 and 5, merging at the eastbound on-ramp for the Troutdale interchange lowers to level of service 'E'. Table 4.9-5 summarizes each of the freeway and merging levels of service with respect to each interchange ramp.

Levels of service reflect ability of the roadway to accommodate traffic, but do not reflect safety. There are a number of safety issues which need to be addressed in the interchange improvements that are not captured in the LOS capacity analysis. These operational or safety problems include the narrow roadway for Jordan Road and limited sight distance at the I-84 and Jordan Road undercrossings, the location of access to National Forest land north of I-84 on the freeway on/off ramps, the radii of the curves for the on/off ramps and short ramp distance, and (most important for freeway operations) the short distance between the Troutdale interchange and the Jordan Road interchange.



**TABLE 4.9-5**  
**ESTIMATED RAMP LEVELS OF SERVICE**

<i>Land Use Alternatives with Existing Interchange</i>										
<i>Year</i>	<i>Current</i>	<i>Alt. 1</i>	<i>Alternative 2</i>		<i>Alternative 3</i>		<i>Alternative 4</i>		<i>Alternative 5</i>	
	<i>1991</i>	<i>2015</i>	<i>†1998</i>	<i>2015</i>	<i>†1998</i>	<i>2015</i>	<i>†1998</i>	<i>2015</i>	<i>†1998</i>	<i>2015</i>
I-84 EB On-Ramp at Troutdale										
Freeway	B	D	B	D	B	D	B	D	B	D
Merge	B	D	C	E	C	E	C	E	C	E
I-84 EB On-Ramp at Jordan										
Freeway	A	C	B	D	B	D	B	D	B	D
Merging	B	C	B	D	B	D	B	C	B	C
I-84 WB Off-Ramp at Jordan										
Freeway	A	B	A	B	A	B	A	B	A	B
Merge	A	B	B	B	B	B	B	B	B	B
I-84 EB Off-Ramp at Jordan										
Freeway	B	D	B	D	B	D	B	D	B	D
Merge	B	D	C	D	C	D	C	D	C	D
I-84 WB On-Ramp at Jordan										
Freeway	A	B	B	B	B	B	B	B	B	B
Merge	B	C	B	C	B	C	B	C	B	C
I-84 WB Off-Ramp at Troutdale										
Freeway	A	B	B	B	B	B	B	B	B	B
Merge	B	C	B	C	B	C	B	C	B	C

†Note: Evaluated under the worst case scenario.

### ***Diamond Interchange***

Traffic weaving levels of service between the Troutdale and Jordan Road interchanges were investigated. The westbound weaving and westbound non-weaving sections all would operate under a level of service of 'A' or 'B'. However, at the eastbound weaving and eastbound non-weaving sections, level of service drops to 'C' during the 2015 summer PM peak hour. Table 4.9-6 summarizes the directional weaving and non-weaving levels of service between the Troutdale and Jordan Road interchange.

**TABLE 4.9-6  
2015 WEAVING LEVEL OF SERVICE**

<i>LAND USE ALTERNATIVES WITH INTERCHANGE CONFIGURATION</i>										
<i>Location</i>	<i>Alternative 1</i>		<i>Alternative 2</i>		<i>Alternative 3</i>		<i>Alternative 4</i>		<i>Alternative 5</i>	
	<i>Diamond</i>	<i>Folded Diamond</i>	<i>Diamond</i>	<i>Folded Diamond</i>	<i>Diamond</i>	<i>Folded Diamond</i>	<i>Diamond</i>	<i>Folded Diamond</i>	<i>Diamond</i>	<i>Folded Diamond</i>
EB Weaving	C	B	C	C	C	C	C	B	C	C
EB Non-Weaving	B	B	C	B	C	B	B	B	B	B
WB Weaving	B	B	B	B	B	B	B	B	B	B
WB Non-Weaving	B	B	B	B	B	B	B	B	B	B

### ***Jordan Road Intersections***

Capacity and level of service at the intersections of Jordan Road were also investigated. Assuming stop-sign control, these intersections are estimated to operate at a level of service of 'A' or 'B' between the 1998 and 2015 summer PM peak hour, under all five land use alternatives. The worst situation occurred with a left turn from the gateway facility onto Jordan Road. This operates at a level of service 'B' for the 2015 summer PM peak hour.

## **4.9.2 Alternative 1 - No Action**

### ***Short-Term Impacts***

Since this alternative represents the no action alternative for land use improvements and the interchange, no short-term/construction activities would occur.

### ***Long-Term Impacts***

**Traffic Generation.** The land uses proposed with Alternative 1 would not generate any additional traffic. Future (2015) traffic conditions are indicated on Figure 4.9-1 for the no action land use and interchange alternatives. In comparison to existing traffic volumes (see Figure 3.9-1) traffic volumes are expected to increase in the future, primarily due to regional population growth.

**Level of Service.** With no change in the configuration of the Jordan Road interchange, traffic patterns would continue as they are under existing conditions. Because the interchange would not be improved the existing freeway operational problem would not be corrected as noted in Chapter 2. This includes the weaving problems caused by the inadequate distance between the Graham Road and Jordan Road ramps. The substandard design of the interchange would contribute to a reduction in LOS (see Table 4.9-5) along with the increase in background traffic due to regional growth.

The opportunity to orient visitors to the NSA and improve traffic flow through this segment of the Gorge would not be realized with this alternative.

**Parking.** No additional parking would be provided with this alternative. As recreational demand increases in the region, the demand for parking at this site would increase. This demand would continue to be met at Lewis and Clark State Park or through unauthorized parking along Jordan Road. There are potential safety problems associated with unauthorized parking along Jordan Road and the interchange ramps.

**Accessibility.** Access to the site for recreational use would not be improved. Informal parking next to the interchange and along Jordan Road would continue. Accessibility to the site for emergency/law enforcement services would remain the same.

#### 4.9.3 Alternative 2

##### *Short-Term Impacts*

All the action alternatives would involve construction activities for development of the gateway and parking facilities, preparation of the trails, and improvements to the interchange and Jordan Road. Other than the interchange and Jordan Road, construction of the site improvements would not result in traffic problems. The primary traffic impacts would occur during construction of the interchange and Jordan Road modifications. These could result from movement of heavy equipment, and lane closures or detours. To minimize traffic interruptions and interruptions to essential services, a construction staging plan would be implemented. The plan would be coordinated with all appropriate parties (i.e., ODOT, FS, OPRD, UPRR, etc.) and would include a step-by-step process for closing travel lanes, re-routing traffic, and re-opening lanes. Phased construction would maintain access to Lewis and Clark State Park and the HCRH. Temporary railroad facilities, or "shoo-flies", would be constructed to maintain traffic flow for UPRR rail operations. The timing of lane blockage and movement of heavy equipment would be coordinated to minimize traffic delays during peak hours. Construction-related noise impacts are described in Section 4.11; Air Quality impacts are described in Section 4.10; and Utilities impact in Section 4.12.

### ***Long-Term Impacts***

**Traffic Generation.** The land uses proposed with Alternative 2 would attract the most NSA traffic to/from the Gateway Complex and the recreation improvements. The amount and distribution of site-generated traffic is shown in Table 4.9-2.

Future (2015) traffic conditions are indicated on Figure 4.9-2 for the Alternative 2 land use alternative with the folded diamond interchange option. In comparison to existing traffic volumes (see Figure 3.9-1) traffic volumes are expected to increase in the future, primarily due to regional population growth -- and to a much lesser extent, due to project-related improvements.

**Level of Service.** The LOS for the existing interchange combined with the Alternative 2 land use alternative (the worst case) is shown in Table 4.9-5. LOS would decline from B or C to D or E without interchange improvements. Table 4.9-6 shows the weaving level of service for each proposed interchange configuration. As shown, the LOS with Alternative 2 with interchange improvements would have minimal impact on the operation of I-84; the LOS for both westbound weaving and non-weaving movements would decrease from B or C to C under either of the interchange options, compared to the no action land use alternative.

**Parking.** An additional 275 paved parking spaces would be constructed under this alternative. Along with the other recreation improvements, improved parking is expected to accommodate existing site uses as well as encourage more visitors to stop and spend time at the site. Parking for Lewis and Clark State Park would not be affected.

**Accessibility.** Access to the area during a 50-year storm flood event would be maintained in the new interchange design except for the segment of Jordan Road under the railroad right-of-way where the elevation would be 28.5 feet (which would be passable during a 25-year storm event).

Access for recreational use would be improved more under this alternative than any other. Bicycle, equestrian, pedestrian and boat access would all be improved. Hiking, mountain biking and equestrian trails would be expanded and an equestrian staging area would be developed. The expanded trail system would improve accessibility for emergency services and law enforcement to all parts of the site.

**Pedestrian/Bicycle Access.** Pedestrian and bicycle use would be encouraged with the improved interchange. With the folded diamond interchange, Jordan Road would be realigned and the new alignment would be designed with pedestrian paths and bike lanes on either side of the new road. Also, the existing Jordan Road alignment would be converted to a pedestrian/bike-only facility.

The interchange modification would also include widening of the I-84 bridges (one in each direction) to accommodate an auxiliary lane, and a bike/pedestrian path would connect the 40-



Mile Loop Trail on the west side of the Sandy River to the Delta and Lower Elevation Gorge trails on the east side of the river.

**Public Transportation.** The gateway parking lot proposed as part of this alternative would be designed to accommodate bus movements and parking. This would be a beneficial effect since no bus parking is available on the Delta under existing conditions.

**Interim Access.** In order to provide safe access to the Gateway and recreational facilities north of I-84, full interchange improvements would be required, including widening of the Sandy River bridges. If only recreation improvements are made, interim access improvements (Figure 2.3-10) will adequately serve the area until 2010.

#### 4.9.4 Alternative 3

##### *Short-Term Impacts*

Construction-related traffic/access impacts would be relatively short-term, assuming that a construction staging plan is implemented. See discussion above in Section 4.9.3.

##### *Long-Term Impacts*

**Traffic Generation.** The land uses proposed with Alternative 3 would capture more NSA traffic than Alternative 1 and 4, but less than Alternative 2. The estimated amount and distribution of site-generated traffic is shown in Table 4.9-4, and assumes that people would stay an average of one-half hour at the moderately-sized gateway center south of I-84. It would not be as large a facility as the gateway in Alternative 2, but would have features for orientation to the Gorge and education about the Delta site.

Future (2015) traffic conditions are indicated in Figure 4.9-3 for the Alternative 3 land use alternative with the folded diamond interchange option. In comparison to existing traffic volumes (see Figure 3.9-1) traffic volumes are expected to increase in the future, primarily due to regional population growth -- not due to project-related improvements.

**Level of Service.** The LOS for the existing interchange (the worst case) combined with the Alternative 3 land use alternative is shown in Table 4.9-5. Without proposed improvements, LOS would decline from B or C to D or E. 2015 weaving LOS for each proposed interchange configuration is shown on Table 4.9-6. As shown, Alternative 3 would have minimal impact on the operation of I-84; the LOS for both westbound and eastbound weaving and non-weaving movements would decrease from B or C to C under either of the interchange options, compared to the no action land use alternative.

**Parking.** This alternative would provide an additional 100 paved parking spaces north of I-84, and 75 paved spaces next to the gateway south of I-84. While this is not as many total parking

spaces as provided with Alternative 2, proposed recreational development under Alternative 3 is less intensive than Alternative 2. Improved parking is still expected to encourage visitors to stop and spend time at the site, although their stops may be shorter. Design of the parking area could accommodate charter and public transit buses.

This alternative would remove the existing OPRD gravel parking lot and be replaced by a new paved parking lot south of I-84. The new parking lot south of I-84 would be shared with Lewis and Clark State Park.

**Accessibility.** Access to the area during a 50-year storm flood event would be maintained in the new interchange design except for the segment of Jordan Road under the railroad right-of-way where the elevation would be 28.5 feet (which would be passable during a 25-year storm event).

Access to the site for recreational uses would be improved in terms of increased hiking and mountain bike trails, connection with the 40-Mile Loop and Lower Elevation Gorge trails and connection with state recreation facilities. Additional boat access would not be provided, and trails would not access the entire site. The expanded trail system would increase accessibility for emergency services and law enforcement, but not as much as Alternative 2.

**Pedestrian/Bicycle Access.** Pedestrian and bicycle use would be encouraged with the improved interchange. With the folded diamond interchange, Jordan Road would be realigned and the new alignment would be designed with pedestrian paths and bike lanes on either side of the new road. Also, the existing Jordan Road alignment would be converted to a pedestrian/bike-only facility.

The interchange modification would also include widening of the I-84 bridges (one bridge in each direction) to accommodate an auxiliary lane and a bike/pedestrian path would connect the 40-Mile Loop Trail on the west side of the Sandy River to the Delta and Lower Elevation Gorge trails on the east side of the river.

**Public Transportation.** The gateway parking lot would be designed to accommodate bus movements and parking. This would be considered a beneficial effect over existing conditions.

**Interim Access.** The majority of the traffic to the site would be attracted by the Gateway, which would be located south of I-84 in this alternative. If the restoration center and recreational facilities only were constructed, it would be possible to provide safe access to these facilities without completing all of the improvements proposed in this alternative. Interim access to recreational facilities could be provided by reconstructing the north side ramps to I-84 within the footprint of the proposed ramp configuration, but not at the same elevation, and by addressing the limited sight distance and width problems associated with the I-84 undercrossings. Potential measures might include installing demand actuated traffic signals at the intersection of the south-side interchange ramps with Jordan Road or realigning Jordan Road to improve sight distance.

Construction of the Gateway facility would require full reconstruction of the interchange and Jordan Road.

#### 4.9.5 Alternative 4

##### *Short-Term Impacts*

Construction-related traffic/access impacts would be relatively short-term assuming that a construction staging plan is implemented. See discussion above in Section 4.9.3.

##### *Long-Term Impacts*

**Traffic Generation.** Alternative 4 would provide an unstaffed information kiosk and fewer parking spaces than either Alternatives 2 or 3. As a result, fewer visitors would stop and most visitors to the kiosk would use it to quickly obtain information about the Gorge before continuing eastward into the Gorge.

Future (2015) traffic conditions are indicated on Figures 4.9-4 for the Alternative 4 land use alternative with the diamond interchange option. In comparison to existing traffic volumes (see Figure 3.9-1) traffic volumes are expected to increase in the future, primarily due to regional population growth -- not due to project-related improvements.

**Level of Service.** The LOS for the existing interchange combined with the Alternative 4 land use (the worst case) is shown in Table 4.9-5. The LOS would decline from B or C to D or E without the proposed improvements. The worst case is the eastbound merge lane. 2015 weaving LOS for this land use alternative combined with each possible interchange configuration is shown on Table 4.9-6. Alternative 4 would have minimal impact on the operation of the I-84 with the proposed improvements; the LOS for both westbound and eastbound weaving and non-weaving movements would remain the same under either of the interchange options, compared to the no action land use alternative.

Indirectly, the informational kiosk could affect travel in the NSA by more efficiently orienting visitors and facilitating traffic through the corridor, but not as well as a staffed Gateway.

**Parking.** Like Alternative 3, this alternative would remove the existing OPRD gravel parking lot and replace it with the 75-space paved parking lot at the Gateway kiosk. The new parking lot south of I-84 would be shared with Lewis and Clark State Park.

**Accessibility.** The limited trails under this alternative would result in less access to the area for emergency and law enforcement services compared to Alternatives 2, 3, and 5, but would represent increased access compared to Alternative 1. Trail access would be limited to the Thousand Acres, and the existing boat dock east of the site would be removed.

**Pedestrian/Bicycle Access.** As with Alternatives 2 and 3, pedestrian and bicycle access would be improved over existing conditions. Both the diamond interchange and the folded diamond options would relocate where Jordan Road crosses under I-84. Pedestrian paths and bike lanes would be incorporated into the new road crossing. The existing Jordan Road alignment would be converted to a pedestrian/bicycle-only facility. In addition, where Jordan Road crosses under the UPRR bridge next to the Sandy River, the road would be improved to allow for safer bicycle/pedestrian travel.

The interchange modification would also include widening of the I-84 bridges (one bridge in each direction) to accommodate an auxiliary lane, and a bike/pedestrian path would connect the 40-Mile Loop Trail on the west side of the Sandy River to the Delta and Lower Elevation Gorge trails on the east side of the river.

**Public Transportation.** The gateway parking lot for the informational kiosk would be designed to accommodate bus movements and parking. This would be considered a beneficial effect over existing conditions.

**Interim Access.** Because parking for all uses would be located south of I-84 adjacent to the kiosk in this alternative, it is not possible to separate the improvements needed for the Gateway from those needed for the recreational development. Although this alternative is expected to attract fewer visitors than other alternatives, there would be no way to safely get them from the parking lot to the site without upgrading the interchange and the Jordan Road undercrossings of both I-84 and the UPRR. Therefore, no interim access measures are recommended.

#### **4.9.6 Alternative 5**

Alternative 5 is a blended alternative, combining features found in other alternatives. Under this alternative, the gateway function would be filled by a kiosk located south of I-84, as in alternative 4. However, Alternative 5 includes a moderate level of recreational development, and construction of a restoration center and caretaker's residence with 100 parking spaces north of I-84, as in Alternative 3.

##### ***Short-Term Impacts***

Construction-related traffic/access impacts would be relatively short-term assuming that a construction staging plan is implemented. See discussion above in Section 4.9.3.

##### ***Long-Term Impacts***

**Traffic Generation.** The land uses proposed with Alternative 5 would capture more NSA traffic than Alternative 1 and 4, but less than Alternative 2 or 3. The estimated amount and distribution of site-generated traffic is shown in Table 4.9-4, and assumes that people would



stay an average of fifteen minutes at the unstaffed gateway kiosk south of I-84. It would have information for orientation to the Gorge and education about the Delta site.

Future (2015) traffic conditions are indicated in Figure 4.9-3 for the Alternative 5 land use pattern with the folded diamond interchange option. In comparison to existing traffic volumes (see Figure 3.9-1) traffic volumes are expected to increase in the future, primarily due to regional population growth -- not due to project-related improvements.

**Level of Service.** The LOS for the existing interchange combined with the Alternative 5 land use pattern (the worst case) is shown in Table 4.9-5. LOS would decline from B or C to D or E without improvements. Table 4.9-6 shows the 2015 weaving LOS for each possible interchange configuration with this land use pattern. As shown, Alternative 5 would have minimal impact on the operation of the I-84; the LOS for both westbound and eastbound weaving and non-weaving movements would decrease from B or C to C under either of the interchange options, compared to the no action land use alternative.

**Parking.** This alternative would provide an additional 100 paved parking spaces north of I-84, and 75 paved spaces next to the gateway kiosk south of I-84. While this is not as many total parking spaces as provided with Alternative 2, proposed recreational development is less intensive, and the gateway function would be served by a kiosk. Design of the parking area adjacent to the kiosk could accommodate charter and public transit buses.

This alternative would remove the existing OPRD gravel parking lot and be replaced by a new paved parking lot south of I-84 adjacent to the kiosk. The new parking lot south of I-84 would be shared with Lewis and Clark State Park.

**Accessibility.** Access to the area during a 50-year storm flood event would be maintained in the new interchange design except for the segment of Jordan Road under the railroad right-of-way where the elevation would be 28.5 feet (which would be passable during a 25-year storm event).

Access to the site for recreational uses would be improved in terms of increased hiking and mountain bike trails, connection with the 40-Mile Loop and Lower Elevation Gorge trails and connection with state recreation facilities. The existing boat moorage would be moved north with improved access to the site, but trails would not access the entire site. The expanded trail system would increase accessibility for emergency services and law enforcement the same as Alternative 3, but not as much as Alternative 2.

**Pedestrian/Bicycle Access.** Pedestrian and bicycle use would be encouraged with the improved interchange. With the folded diamond interchange, Jordan Road would be realigned and the new alignment would be designed with pedestrian paths and bike lanes on either side of the new road. Also, the existing Jordan Road alignment would be converted to a pedestrian/bike-only facility.

The interchange modification would also include widening of the I-84 bridges (one bridge in each direction) to accommodate an auxiliary lane and a bike/pedestrian path would connect the 40-Mile Loop Trail on the west side of the Sandy River to the Delta and Lower Elevation Gorge trails on the east side of the river.

**Public Transportation.** The parking lot adjacent to the kiosk would be designed to accommodate bus movements and parking. This would be considered a beneficial effect over existing conditions.

**Interim Access.** The majority of the traffic to the site would be attracted by the Gateway kiosk, which would be located south of I-84 in this alternative. If the restoration center and recreational facilities only were constructed, it would be possible to provide safe access to these facilities without completing all of the improvements proposed in this alternative. Interim access to recreational facilities could be provided by reconstructing the north side ramps to I-84 within the footprint of the proposed ramp configuration, but not at the same elevation, and by addressing the limited sight distance and width problems associated with the I-84 undercrossings. Potential measures might include installing demand actuated traffic signals at the intersection of the south-side interchange ramps with Jordan Road, or realigning Jordan Road to improve sight distance. Figure 2.3-10 shows the interim access plan.

Construction of the Gateway facility would require full reconstruction of the interchange and Jordan Road.

#### **4.9.7 Cumulative Effects**

The traffic effects analysis for the land use alternatives and interchange design options in Sections 4.9.2 to 4.9.6 considered the cumulative effects of traffic potentially generated by the proposed alternatives combined with background traffic estimated for the year 2015. The background traffic projections were provided by ODOT and assume increases in traffic volumes consistent with regional population growth. Therefore, the traffic analysis in this section represents a cumulative analysis.

#### **4.9.8 Mitigation Measures**

- 4.9 - 1. To minimize traffic interruptions and interruptions to essential services, elements of an approved construction staging plan would be implemented. The plan would be coordinated with all applicable parties (i.e., ODOT, FS, OPRD, UPRR, etc.), and would include a step-by-step process for closing travel areas, re-routing traffic, and re-opening travel lanes. Phased construction would maintain access to Lewis and Clark State Park and the HCRH, and "shoo-flies" would be used to maintain traffic flow and rail operations. The timing of lane blockage and

movement of heavy equipment would be coordinated to minimize traffic delays during peak hours.

- 4.9 - 2. Project stockpiles would be screened from the road to reduce view impacts.
- 4.9 - 3. Right-of-way vegetation would be managed to minimize visual impacts of clearing and to enhance views from the highway.

#### **4.9.9 Summary**

Table 4.9-7 presents a summary of the transportation and access effects for the four alternatives. Short-term disruption of traffic and access would occur during construction, especially for the interchange improvements. However, these could be mitigated through careful construction phasing and other identified mitigation measures. The alternatives would divert varying amounts of NSA visitor traffic to the site, but no adverse traffic effects would occur in the long term. The interchange and Jordan Road improvements would be beneficial to traffic flow, safety, and access.

**TABLE 4.9-7  
SUMMARY OF TRANSPORTATION/ACCESS EFFECTS**

<i>EFFECTS</i>	<i>ALTERNATIVE 1</i>	<i>ALTERNATIVE 2</i>	<i>ALTERNATIVE 3</i>	<i>ALTERNATIVE 4</i>	<i>ALTERNATIVE 5</i>
Substantial disruption of traffic & access during construction	No construction required	Short-term disruption of traffic on Jordan Road and I-84 expected; no disruption of UPRR operation expected	Short-term disruption of traffic on Jordan Road and I-84 expected; no disruption of UPRR operation expected	Short-term disruption of traffic on Jordan Road and I-84 expected; no disruption of UPRR operation expected	Short-term disruption of traffic on Jordan Road and I-84 expected; no disruption of UPRR operation expected
Increase in vehicular traffic generated at the site	No change over existing conditions	Approximately 210 trips generated during the peak hour	Approximately 180 trips generated during the peak hour	Approximately 115 trips generated during the peak hour	Approximately 155 trips generated during the peak hour
Change in access to Delta site and Lewis & Clark State Park	No change over existing access	Safer and more direct access to Delta site; safer access to Lewis & Clark State Park (via realigned Jordan Road)	Safer and more direct access to Delta site; safer access to Lewis & Clark State Park (via realigned Jordan Road)	Safer and more direct access to Delta site; safer access to Lewis & Clark State Park	Safer and more direct access to Delta site; safer access to Lewis & Clark State Park (via realigned Jordan Road)
Change in pedestrian and bicycle access	No change in existing conditions	Improved bicycle and pedestrian access to site, Lewis & Clark State Park, and trails (Delta, 40-mile Loop and Lower Elevation Gorge)	Improved bicycle and pedestrian access to site, Lewis & Clark State Park, and trails (Delta, 40-mile Loop and Lower Elevation Gorge)	Improved bicycle and pedestrian access to site, Lewis & Clark State Park, and trails (Delta, 40-mile Loop and Lower Elevation Gorge)	Improved bicycle and pedestrian access to site, Lewis & Clark State Park, and trails (Delta, 40-mile Loop and Lower Elevation Gorge)
Change in access for public transportation (buses)	No change from existing conditions	Safer access to Delta and Lewis & Clark State Park via improved interchange; parking lots provided that could accommodate bus movements and parking	Safer access to Delta and Lewis & Clark State Park via improved interchange; parking lots provided that could accommodate bus movements and parking	Safer access to Delta and Lewis & Clark State Park via improved interchange; parking lots provided that could accommodate bus movements and parking	Safer access to Delta and Lewis & Clark State Park via improved interchange; parking lots provided that could accommodate bus movements and parking



## **4.10 AIR QUALITY**

### **4.10.1 Issues and Analysis Methodology**

The air quality analysis presents the estimated one-hour concentrations of carbon monoxide (CO), for each of the alternatives at six receptor locations in and near the site. These receptors are discussed in Section 3.10 and displayed in Figure 3.10-1. CO concentrations at locations where people may be exposed was the primary criterion for evaluating the air quality implications of the alternatives.

Traffic data used in the CO analysis was based on the traffic analysis presented in Section 4.9. As discussed in Section 4.9, project-related traffic volumes are not expected to increase substantially compared to background volumes. However, recreational development at the site will divert more NSA tourist traffic to the site than the No Action alternative.

CO emission rates were estimated using the EPA's Mobile 5A model (EPA, 1993). For further information on Mobile 5A and assumptions made see Section 3.10.

Caline3 (Benson, 1979) was used to calculate peak-hour CO concentrations at the six receptors identified in Figure 3.10-1, Section 3.10. (For more information on Caline3 see Section 3.10.)

Table 4.10-1 identifies calculated peak-hour CO concentrations for existing conditions and each of the alternatives in 2015. It indicates that CO concentrations would decrease relative to existing levels at all six locations in the future, regardless of which alternative is selected. Concentrations are presently about 10 percent of the one-hour CO standard of 35 ppm, and would remain at about this level in the future. Because the calculated one-hour CO concentrations are also well-below the eight-hour average CO standard of 9 ppm, conversions of the calculated one-hour CO concentrations to eight-hour concentrations were not warranted.

### **4.10.2 Alternative 1 - No Action**

#### ***Short-Term Impacts***

No short-term impacts associated with construction would occur with this alternative.

#### ***Long-Term Impacts***

As shown in Table 4.10-1, estimated CO levels for Alternative 1 would range from 3.2 to 4.3 ppm. This is far below the eight-hour average CO standard of 9 ppm, and less than existing (1991) levels. CO emissions for the study area would decrease despite the rise in traffic levels. This would occur because, over the next several years, high-polluting vehicles will be replaced with newer, more efficient vehicles.

**TABLE 4.10-1**  
**PREDICTED LOCAL CARBON MONOXIDE LEVELS**  
**(in parts per million)**

Receptor	Existing CO Conc.*	Alt. 1 (No Action)		2015 Alt. 2			2015 Alt. 3			2015 Alt. 4			2015 Alt. 5		
		CO Conc.	Change vs. Existing	CO Conc.	Change vs. Existing	Change vs. No-Build	CO Conc.	Change vs. Existing	Change vs. No-Build	CO Conc.	Change vs. Existing	Change vs. No-Build	CO Conc.	Change vs. Existing	Change vs. No-Build
1	3.4	3.3	-.1	3.3	-.1	0	3.3	-.1	0	3.3	-.1	0	3.3	-.1	0
2	3.3	3.2	-.1	3.2	-.1	0	3.2	-.1	0	3.2	-.1	0	3.2	-.1	0
3	3.4	3.3	-.1	3.4	0	.1	3.4	0	.1	3.4	0	.1	3.4	0	.1
4	3.8	3.7	-.1	3.5	-.3	-.2	3.5	-.3	-.2	3.5	-.3	-.2	3.5	-.3	-.2
5	3.3	3.2	-.1	3.4	.1	.2	3.2	-.1	0	3.2	-.1	0	3.2	-.1	0
6	5.0	4.3	-.7	4.5	-.5	.2	4.4	-.6	.1	4.2	-.8	-.1	4.3	-.6	-.1

### 4.10.3 Alternative 2

#### *Short-Term Impacts*

This alternative could result in localized increases in dust and exhaust emissions as a result of construction activities and equipment. These are relatively short-term and limited effects. Standard construction practices, such as those identified as mitigation measures, would reduce the effects of construction-related dust and exhaust emissions.

Alternative 2 may use prescribed fire as a possible method for maintenance of vegetation. The burning of vegetation at the site would generate short-term increases in air pollution. The magnitude and location of impact would depend on the burning conditions, the areal extent of the burn, and local winds during the burn. Wet, dense foliage would burn slower and create much more air pollution than dry vegetation exposed to ample combustion air. The heat generated by a hot fire is also apt to produce a plume that rises higher and disperses more prior to affecting ground level receivers. Finally, selecting periods when winds are likely to minimize air quality impacts on neighboring properties (especially residences, the Portland-Troutdale Airport, and I-84) will be important.

Factors such as these would be considered in a burn plan for any prescribed burning that occurs on-site. The FS would develop a burn plan as per FSM 5100. The FS would need to comply with smoke management regulations administered by the Oregon Department of Forestry (ODF). These regulations help determine appropriate burning days and require the FS to get a permit from ODF. It is expected burn days would be few, given wind conditions and the site's proximity to I-84 and the Portland and Vancouver Metropolitan areas.

#### *Long-Term Impacts*

This alternative would divert the largest number of Gorge tourists to the site, and as a result, generate the greatest amount of additional traffic to the site of the five alternatives. It would result in a small increase in CO emissions compared to Alternative 1 (no action). However, the CO levels would still decrease from current conditions for the reasons described for Alternative 1.

#### *Conformity with State Implementation Plan*

The federal Clean Air Act (CAA) requires the state to take actions to reduce air pollution in non-attainment areas to the extent that federal health-based standards are not exceeded, and to provide enough control measures to assure attainment for at least ten years. The framework that provides for meeting these goals is the State Implementation Plan (SIP). Because the study area is located outside the Portland-Vancouver ozone non-attainment area but is within a marginal CO non-attainment area, the project must conform to air quality implementation plans.

Under section 176(c) of the CAA, as amended in 1990, METRO is the responsible metropolitan planning organization, and ODOT cannot adopt, approve, or accept any transportation improvement plans, programs, or projects unless they conform to the Oregon SIP.

Conformity to an implementation plan is defined as conforming with a plan's purpose of eliminating or reducing the severity and number of violations of a National Ambient Air Quality Standard (NAAQS), and achieving expeditious attainment of such standards. The federal rules and regulations governing conformity are described in the EPA 40 CFR parts 51 and 93.

In accordance with the conformity guidelines, METRO, as the local metropolitan planning organization, was consulted regarding conformance of the proposed project with existing transportation and air pollution control plans. METRO staff provided the following information (Whistler, 1994):

- The proposed relocation and redesign of the I-84 on- and off-ramps would allow for some future widening of I-84 should it be deemed necessary. However, there would be no increase in the traffic-carrying capacity of I-84 or the Jordan Road interchange ramps as part of the project. Therefore, reconstruction of the ramps would not have any regional air quality significance in terms of carbon monoxide or ozone concentrations, and no regional modeling is required.
- The proposed project is not currently included in the existing Regional Transportation Plan or Regional Transportation Improvement Program (TIP) and has not been modeled as part of the METRO's conformity assessment. Because the project is on the regional transportation system, is in the non-attainment area for CO and affects the ozone non-attainment area, the project is subject state and federal conformity rules.

According to ODOT:

- The proposed project needs to be identified in the Regional Transportation Plan (RTP)/TIP for funding so it can advance through the NEPA evaluation of those projects. The project is exempt from a regional emission analysis according to the Federal Transportation Conformity Rule (40 CFR, Part 51, Subpart T, Section 51.462). The Jordan Interchange project is in the 1995-98 Statewide Transportation Improvement Program (STIP) in the Reconnaissance Section (meaning the project has no construction year, but is included under the EIS level). Once a construction year has been established for the project, it will be included in the RTP/TIP.



The site-specific modelling discussed in this section constitutes a "project-level" conformity analysis as defined in appropriate regulations. Based on this analysis, the following project-level conformity statement applies.

- Local concentrations of CO associated with the project alternatives were predicted using regulatory models. With Alternatives 2, 3, 4, and 5 in the project design year 2015, the maximum predicted 1-hour CO concentrations were 4 ppm, which are well below the 1-hour CO NAAQS and low enough to be in compliance with the 8-hour standard as well. Consequently, no alternatives would increase the frequency or severity of any existing violations of the CO standard, nor would they create new violations of the CO standards. The project would, therefore, conform to the purpose of the current SIP, and to all requirements of the CAA Amendments of 1990.

#### **4.10.4 Alternative 3**

##### ***Short-Term Impacts***

Short-term air quality impacts of this alternative would be similar to those described for Alternative 2 (Section 4.10.3, above).

Alternative 3 may use prescribed fire as a possible method for maintaining vegetation. The impacts would be similar to those described for Alternative 2. See discussion of the potential air quality effects of prescribed burning in Section 4.10.3.

##### ***Long-Term Impacts***

This alternative would divert slightly lower Gorge tourist traffic levels to the site than Alternative 2. This would result in CO levels that are approximately the same as Alternative 1 (no action) and Alternative 2. The CO levels would be lower for this alternative than current levels for the reasons outlined in Section 4.10.1.

##### ***Conformity with State Implementation Plan***

See Section 4.10.3 for discussion of this alternative's conformity with the SIP.

#### **4.10.5 Alternative 4**

##### ***Short-Term Impacts***

Short-term air quality impacts of this alternative would be similar to those described for Alternative 2 (Section 4.10.3), except that this alternative would not use prescribed burning as a vegetation maintenance method.

##### ***Long-Term Impacts***

Long-term impacts for this alternative would be similar to those for Alternative 3 (Section 4.10.4).

##### ***Conformity with State Implementation Plan***

See Section 4.10.3 for discussion of conformity with the SIP.

#### **4.10.6 Alternative 5**

##### ***Short-Term Impacts***

Short-term air quality impacts of this alternative would be similar to those described for Alternative 2 (Section 4.10.3).

##### ***Long-Term Impacts***

Long-term air quality impacts would be similar to those described for Alternative 3 (Section 4.10.4).

##### ***Conformity with the State Improvement Program***

See Section 4.10.3 for a discussion of conformity with the SIP.

#### **4.10.7 Cumulative Effects**

The year-2015 CO modeling conducted for Alternatives 1 through 5, is based on cumulative traffic levels using ODOT's year-2015 regional growth assumptions for traffic on I-84. Therefore, the models take into account the cumulative effects of past, present, and reasonably foreseeable future projects, including projected increases in Gorge tourism.

Also, the Mobile 5A model takes into account the stricter mandates on vehicle emissions and resulting cleaner vehicles in predicting future emission levels from vehicles.

#### 4.10.8 Mitigation Measures

- 4.10 - 1. Emissions from construction equipment and trucks would be reduced by using relatively new, well-maintained equipment. Avoiding prolonged periods of vehicle idling and engine-powered equipment would also reduce emissions.
- 4.10 - 2. When feasible, materials would be trucked to and from the project area during non-peak travel times to minimize congestion. This would minimize secondary air quality impacts caused by traffic having to travel at reduced speeds.
- 4.10 - 3. Dust produced by construction would be reduced by several techniques; including the following:
- Areas of exposed soils such as storage yards and construction roadways could be sprayed with water or other dust suppressants.
  - Unpaved roads and other areas that might be exposed for prolonged periods could be paved, planted with a vegetation ground cover, or covered with gravel.
- 4.10 - 4. The amount of soils carried out of the construction area by trucks would be reduced by washing of deposits of mud, dirt, and other debris on the vehicle's body, fenders, frame, undercarriage, and wheels. Covering dusty truck loads and providing adequate freeboard to prevent spillage can also minimize fugitive dust from construction trucks.
- 4.10 - 5. If an alternative is selected that would use prescribed burning to maintain vegetation, the FS would develop a burn plan and obtain a permit from the ODF prior to implementing any burning.

Since the modeled ambient air quality would not exceed state or federal air quality standards, no mitigation measures are required for long-term air quality impacts.

#### 4.10.9 Summary

Short-term air quality effects, from construction would be relatively short in duration and limited in the area affected by the construction. However, standard construction practices would be implemented and would further reduce the impact of these emissions. The prescribed burning (proposed with Alternatives 2, 3, and 5) could result in significant short-term effects,

and would, therefore, need to be mitigated through development and implementation of a burn plan and receipt of a permit from ODF.

Of the five alternatives, Alternative 2 would involve the greatest increase in Gorge tourist traffic diverted to the site as a result of improvements in the study area and therefore, the greatest increase in carbon monoxide (CO) concentrations attributable to traffic. However, CO concentrations would be lower than today with all four alternatives and would remain well within the federal and state guidelines of 35 ppm CO for a one-hour average and 9 ppm CO for an eight-hour average. Therefore, there would not be a significant impact to air quality as a result of any alternative chosen. See Table 4.10-2 for a summary of the air quality effects.

**TABLE 4.10-2  
SUMMARY OF AIR QUALITY EFFECTS**

<i>EFFECTS</i>	<i>ALTERNATIVE 1</i>	<i>ALTERNATIVE 2</i>	<i>ALTERNATIVE 3</i>	<i>ALTERNATIVE 4</i>	<i>ALTERNATIVE 5</i>
<b>Significant increase in short-term project-related air pollution?</b>	Since this alternative calls for no construction, or prescribed burning there would be no increase of short-term air pollution	Temporary increase in local dust levels and exhaust emissions due to construction. Short-term increases in air pollution due to possible prescribed burning	Temporary increase in local dust levels and exhaust emissions due to construction. Short-term increases in air pollution due to possible prescribed burning	Temporary increase in local dust levels and exhaust emissions due to construction	Temporary increase in local dust levels and exhaust emissions due to construction. Short-term increases in air pollution due to possible prescribed burning
<b>Exceedance of air quality standards?</b>	CO levels would not exceed standards	CO levels would not exceed standards	CO levels would not exceed standards	CO levels would not exceed standards	CO levels would not exceed standards

## **4.11 NOISE**

### **4.11.1 Issues and Analysis Methodology**

This section addresses the transportation noise effects of each of the alternatives, as well as the potential for noise impacts to affect the location of proposed facilities. Traffic data used in the noise analysis was based on the traffic analysis presented in Section 4.9. Train and plane noise sources are also described, but not quantified, because they are existing noise sources that will not be affected by the proposed action.

Stamina 2.0 was used to model traffic noise levels at the same receptor locations as those used in the field measurements. (For further information on the Stamina 2.0 model see Section



3.11). The receptors represent the sensitive locations nearest the existing and proposed road alignments (receptor locations are discussed in Section 3.11 and shown in Figure 3.11-1).

This evaluation uses noise criteria and guidelines established by the FHWA, which focus on the hourly Leq. The Leq is the equivalent level of a constant sound with the same energy as the actual fluctuating sound for a one-hour interval.

FHWA identified noise criteria and established procedures for evaluating road improvement projects in 23CFR722. The FHWA defines a traffic noise impact as a traffic noise level approaching or exceeding the noise abatement criteria levels according to land uses shown in Table 4.11-1, or predicted traffic noise levels substantially exceeding existing noise levels. ODOT interprets the FHWA guidelines to mean that a noise impact occurs if levels reach or exceed the noise abatement criteria. Also, noise increases of 5 to 10 dBA or greater are considered "significant" noise increases greater than 10 dBA would be considered "substantial." Traffic noise impacts described in this report follow these ODOT guidelines.

All of the receptor locations, except location 4, are considered to be in category (B), having a noise level limit of 67 dBA. Receptor location 4, located on undeveloped ODOT land, would be in category (B) with either Alternative 3 or 4, but would be in category (D) in the other scenarios, for which there are no impact criteria.

#### **4.11.2 Alternative 1 - No Action**

##### ***Short-Term Impacts***

Since there would be no construction with this alternative, no short-term noise impacts would occur.

##### ***Long-Term Impacts***

Traffic noise levels estimated for this alternative are displayed in Table 4.11-2. As shown, future traffic from regional growth would result in increased noise levels. The maximum increase would be 4 dBA, which ODOT does not consider significant. Noise levels would not exceed FHWA criteria for five of the receptor locations. However the houses west of the Sandy River which currently exceed FHWA criteria would increase from 69 dBA to 76 dBA in 2015. Therefore this would be considered a noise-impacted location.

**TABLE 4.11-1  
FHWA ROADWAY NOISE ABATEMENT CRITERIA**

<i>LAND USE CATEGORY</i>		<i>HOURLY Leq (dBA)</i>
(A)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.	57 (exterior)
(B)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals.	67 (exterior)
(C)	Developed lands, properties, or activities not included in the above categories.	72 (exterior)
(D)	Undeveloped lands	---
(E)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.	52 (interior)

Source: USDOT, 1982.

**TABLE 4.11-2  
MODELED NOISE LEVELS FOR EXISTING CONDITIONS AND  
ALTERNATIVES 1-4 (In Leq dBA)**

<i>Receptor</i>	<i>1991 Existing</i>	<i>2015 Alt. 1 (No Action)</i>	<i>2015 Alt. 2 (Folded Diamond)</i>	<i>2015 Alt. 3 (Folded Diamond)</i>	<i>2015 Alt. 4 (Diamond)</i>	<i>2015 Alt. 5 (Folded Diamond)</i>
1	60	63	64	64	63	64
2	58	62	62	62	62	62
3	61	64	65	64	64	64
4	62	66	66	66	66	66
5	51	55	55	55	55	55
6						

In accordance with FHWA regulations, traffic noise mitigation measures must be considered for all noise-impacted receptors. Receptor location 6 is currently noise-impacted and would be considered noise-impacted in the future as well. It may be possible to construct a noise wall on the Sandy River Bridge and in the right-of-way on the north side of I-84 near Harlow Place. However, affected residences are planned for light industrial uses, and some are being sold to

change to that use. If this occurs, the property would no longer be considered noise-sensitive and no mitigation would be necessary. Timing for implementation of the project is uncertain. If conversion to industrial use has not occurred by the time final design occurs, analysis of the acoustical and cost effectiveness of noise mitigation would probably be warranted.

Airport operations at the Troutdale Airport (takeoffs and landings) are a major noise source in the study area which result in higher noise levels at intermittent times during the day. (An average of 300 operations occur each day.) However, airport-related noise would not be altered compared to existing levels, and would be the same for this alternative as with the other three alternatives.

Trains pass through the study area an average of 20 times a day (approximately once an hour) and generate intermittent high noise levels in those areas nearest to the railroad tracks (e.g., parts of Lewis and Clark State Park and the ODOT triangle). Because it is intermittent, and occurs relatively infrequently, train noise would not be considered significantly adverse to existing outdoor uses of the site.

#### **4.11.3 Alternative 2**

##### ***Short-Term Impacts***

During construction of the proposed improvements, areas in and adjacent to the study area would be exposed to noise produced by various pieces of construction equipment from a variety of construction activities. Table 4.11-3 shows the typical range of noise levels for construction equipment which could be used during the construction under this alternative (as well as Alternatives 3 and 4).

Areas adjacent to I-84 could be exposed to high noise levels during the construction of interchange and I-84 improvements. The additional noise could be annoying to nearby residents or visitors of the study area since it could add cumulatively to highway-related noise.

##### ***Long-Term Impacts***

Project-related traffic levels would increase more with this alternative than with any of the other alternatives. Higher noise levels are predicted for this alternative at two receptor locations. Leqs would rise from 63 to 64 dBA at receptor 1 and from 64 to 65 dBA at receptor 3. However, the increased noise levels would not exceed FHWA criteria. At receptor 6, which currently exceeds FHWA criteria, Leqs would increase from 69 to 76 dBA.

##### ***Gateway Facility Exposure to Noise***

The gateway facility proposed in this alternative would be located approximately at receptor location 5. As shown in Table 4.11-2, this location would receive 55 dBA under Alternative

2, well below the 67 dBA set in the FHWA noise abatement criteria for this type of land use, (B).

**TABLE 4.11-3  
TYPICAL CONSTRUCTION EQUIPMENT NOISE (dBA)**

<i>TYPES OF ACTIVITIES</i>	<i>TYPES OF EQUIPMENT</i>	<i>RANGE OF NOISE LEVELS AT 50'</i>
Materials Handling	Concrete mixers	75-87
	Concrete pumps	81-83
	Cranes (movable)	76-87
	Cranes (derrick)	86-88
Stationary Equipment	Pumps	69-71
	Generators	71-82
	Compressors	74-87
Impact Equipment	Pneumatic wrenches	83-88
	Rock drills	81-98
Land Clearing	Bulldozer	77-96
	Dump truck	82-94
Grading	Scraper	80-93
	Bulldozer	77-96
Paving	Paver	86-88
	Dump truck	82-94

*Source: EPA, 1971.*

As noted for the other alternatives, airport operations at the Troutdale Airport (takeoffs and landings) are a major noise source in the study area which result in higher noise levels at intermittent times during the day. Exterior noise levels from plane flyovers could not be reduced, but, for most of the site, would not alter the outdoor experience of site visitors compared to existing levels, or the levels experienced with the other three alternatives.

The location of the gateway facility shown for Alternative 2 would experience the most frequent flyovers of the three gateway location alternatives since it would be in a direct line from the airport landing strip. It would also, therefore, experience the highest plane noise. However, all the gateway locations would experience flyovers on an intermittent basis, and would therefore, experience some plane noise. The design of the building for the gateway/restoration center/caretaker's residence should incorporate noise attenuation features



to achieve desired interior noise levels. This would be determined during the acoustical study of the structure at the architectural design phase.

Train noise at this gateway location may be noticeable, but it would not be considered disruptive of the outdoor uses allowed under this alternative of the site. This is due to the relative infrequency of the train pass-bys (less than 1 per hour), the distance between the gateway location and the railroad tracks, and the barrier effect of the intervening freeway and vegetation.

#### **4.11.4 Alternative 3**

##### ***Short-Term Impacts***

See Section 4.11.3 for a discussion of noise from construction equipment. This alternative would require less construction than Alternative 2, and thus could generate less construction-related noise than Alternative 2. The majority of the noise would be associated with construction of the interchange, I-84, and Jordan Road improvements, which would be the same as for Alternative 2.

##### ***Long-Term Impacts***

Alternative 3 would divert more NSA tourist traffic to the site than Alternative 1 and 4, but less than Alternative 2. Receptor 1 is the only location to be impacted by resulting noise above the level of Alternative 1, increasing from 63 to 64 dBA. This increase would not exceed the noise abatement criteria at any of the receptor locations. Receptor 6 would continue to exceed FHWA noise criteria, but less than under Alternative 2. Investigation of the acoustical and cost effectiveness of noise mitigation would probably be warranted if land uses have not changed by the time the project goes to final design.

##### ***Gateway Facility Exposure to Noise***

The gateway facility proposed in this alternative would be located approximately at receptor location 4 south of I-84. As shown in Table 4.11-2, this location would receive 66 dBA from I-84 traffic which is below the 67 dBA set in the FHWA criteria for this type of land use, (B).

As noted for the other alternatives, airport operations at the Troutdale Airport are a major noise source in the study area and may result in high noise levels at intermittent times during the day. Exterior noise levels from plane flyovers would be the same as the other alternatives (see discussion in Section 4.11.2).

The proposed restoration center/caretaker's residence shown for Alternative 3 would experience the same plane noise as is described above for Alternative 2's gateway center. Noise attenuation insulation should be included in the structure. The gateway facility, being located

south of I-84 with this alternative, may experience less plane noise than Alternative 2, but would still experience flyovers on an intermittent basis, and would therefore, experience plane noise.

Train noise at this gateway location would be more noticeable than at the gateway location for Alternative 2, but it would not be considered adverse to the outdoor uses allowed under this alternative. This is primarily due to the relative infrequency of the train pass-bys, (less than 1 per hour) and the expected short-duration of visits to the gateway (30 minutes).

The design of the buildings for the gateway and restoration center/caretaker's residence may need to incorporate noise reduction features to achieve desired interior noise levels. This would be determined during the acoustical study of the structures at the architectural design phase.

#### **4.11.5 Alternative 4**

##### ***Short-Term Impacts***

This alternative would require less construction than Alternatives 2 and 3, and thus would generate less construction-related noise than those alternatives. It would generate more construction noise than Alternative 1. See Section 4.11.2 for a discussion of construction-related noise impacts.

##### ***Long-Term Impacts***

This alternative results in a smaller diversion of NSA tourist trips to the site than both Alternatives 2 and 3, but more than Alternative 1. However, due to the relatively small increase compared to Alternative 1, the noise levels would be the same as for Alternative 1 and would not result in the exceedance of any noise criteria (see Table 4.11-2) for Receptors 1 through 5. Receptor location 6, which currently experiences noise levels above FHWA standards, would continue to be noise-impacted. Investigation of the acoustical and cost effectiveness of noise mitigation would probably be warranted if land uses have not changed to industrial by the time final design occurs.

##### ***Gateway Facility Exposure to Noise***

Under this alternative the unstaffed information kiosk would be located approximately at receptor location 4. In Alternative 4, this location would receive 66 dBA from highway traffic. This does not exceed the FHWA noise abatement criteria for this type of land use.

As noted for the other alternatives, airport operations at the Troutdale Airport are a major noise source in the study area which result in high noise levels at intermittent times during the day. Exterior noise levels from plane flyovers would be the same as for the other alternatives (see

Section 4.11.2). The unstaffed information kiosk located south of I-84 with this alternative, may experience less plane noise than Alternative 2, but would still experience flyovers on an intermittent basis, and would therefore, experience plane noise.

Train noise at the kiosk would be approximately the same as the exterior areas of the gateway center in Alternative 3, and would be more noticeable than at the gateway location for Alternative 2. However, train noise would not be considered adverse to the outdoor uses allowed under this alternative, due to the relative infrequency of the train pass-bys, and the expected short duration of visits (maximum 15 minutes).

No acoustical studies of the kiosk would be required since it would be unstaffed.

#### **4.11.6 Alternative 5**

##### ***Short-Term Impacts***

Construction-related noise impacts for this alternative would be similar to Alternative 3. See Section 4.11.3 for a discussion of construction-related noise.

##### ***Long-Term Impacts***

Long-term noise impacts of Alternative 5 would be similar to Alternative 3. See Section 4.11.4 for a discussion of long-term impacts.

##### ***Gateway Kiosk Noise Exposure***

The effects of traffic and railroad noise on the gateway kiosk would be similar to Alternative 4. See Section 4.11.5 for a discussion of noise exposure at the gateway.

#### **4.11.7 Cumulative Effects**

The year 2015 noise modeling conducted for the different alternatives is based on cumulative traffic levels using ODOT's regional growth assumptions for traffic on I-84. Therefore, they take into account the cumulative effects of the past, present, and reasonably foreseeable future projects, given that highway traffic is the dominant noise generator at the study area.

#### **4.11.8 Mitigation Measures**

According to ODOT policy, the following construction noise abatement measures would be included in the specifications for construction of the I-84 and Jordan Road improvements:

- 4.11 - 1. No construction shall be performed within 1,000 feet of an occupied dwelling unit on Sundays, legal holidays and between the hours of 10:00 P.M. and 6:00 A.M. on other days, without the approval of the Project Manager.
- 4.11 - 2. All equipment used shall have sound control devices no less effective than those provided on the original equipment. No equipment shall have an unmuffled exhaust.
- 4.11 - 3. All equipment shall comply with pertinent equipment noise standards of the U.S. Environmental Protection Agency.
- 4.11 - 4. No pile driving or blasting operations shall be performed within 3,000 feet of an occupied dwelling unit on Sundays, legal holidays and between the hours of 8:00 P.M. and 8:00 A.M. on other days, without the approval of the Project Manager.
- 4.11 - 5. The noise from rock crushing or screening operations performed within 3,000 feet of any occupied dwelling shall be mitigated by strategic placement of material stockpiles between the operation and the affected dwelling or by other means approved by the Project Manager.
- 4.11 - 6. Should a specific noise complaint occur during the construction of the project, the contractor, at his own expense, may be required to implement one or more of the following noise mitigation measures as directed by the Project Manager:
  - a. Locate stationary construction equipment as far from nearby noise sensitive properties as possible.
  - b. Shut off idling equipment.
  - c. Reschedule construction operations to avoid periods of noise annoyance identified in the complaint.
  - d. Notify nearby residents whenever extremely noisy work will be occurring.
  - e. Install temporary or portable acoustic barriers around stationary construction noise sources.
- 4.11 - 7. Construction activities shall be conducted in compliance with applicable local (City of Troutdale or Multnomah County) noise ordinances,



depending on where construction is occurring. (These ordinances are not applicable on Federal land.)

To reduce noise levels for residences north of I-84, west of the Sandy River, which currently exceed FHWA standards and would continue to do so, noise mitigation may need to be incorporated in the final design of interchange improvements. However, the area is planned for and is in the process of converting to non-noise sensitive use, and mitigation may not be necessary, depending on the timing of interchange improvements.

To reduce interior noise levels at the gateway facility, restoration centers, and caretaker's residence for Alternatives 2, 3, and 5, the following measure is recommended:

- 4.11 - 8. An acoustical study of the structures will be conducted during the architectural design phase to determine if any special noise attenuation features would be needed to achieve desired interior noise levels.

#### **4.11.9 Summary**

The geometry of the interchange would have little to do with future traffic noise levels. Table 4.11-4 presents a summary of the noise effects for each of the alternatives. The main cause of the difference in highway noise levels of the alternatives is the difference in estimated traffic volumes, not roadway geometries. Because Alternative 2 has the greatest estimated traffic volume, it would generate the greatest increase in noise. Any other option having a traffic volume on I-84 equal to that of Alternative 2, would generate similar noise levels. Thus, virtually the entire increase in noise is attributable to increases in traffic on I-84 that would occur regardless of which alternative is selected.

The project related maximum change in noise levels between existing conditions and any of the build alternatives is 5 dBA. However, Receptor 6 which currently experiences noise levels above FHWA standards, would continue to do so. Because timing of interchange improvements is uncertain, and the area around Receptor 6 is changing from residential to industrial uses, noise mitigation is not included at this stage, but should be considered when final design occurs.

Noise from airport and railroad operations generate loud noise levels at intermittent times each day. These operations would not be altered by the project alternatives. Outdoor activities in the study area would continue to be exposed to these noise sources, as well as the highway noise, addressed above. The levels would primarily depend on the distance between the source and the receptor. If Alternative 2, 3, or 5 is selected, interior noise levels may need to be reduced; this can be achieved through structure design.

**TABLE 4.11-4  
SUMMARY OF NOISE EFFECTS**

<b>EFFECTS</b>	<b>ALTERNATIVE 1</b>	<b>ALTERNATIVE 2</b>	<b>ALTERNATIVE 3</b>	<b>ALTERNATIVE 4</b>	<b>ALTERNATIVE 5</b>
<b>Increase in noise due to construction?</b>	No increase in noise levels due to construction	Temporary increase due to construction	Temporary increase due to construction	Temporary increase due to construction	Temporary increase due to construction
<b>Increases in noise from I-84 due to project-related traffic?</b>	No increase in project-related traffic would occur. (All increases will be from regional traffic growth)	Minimal increases in noise would result from project-related traffic	Minimal increases in noise would result from project-related traffic	Minimal increases in noise would result from project-related traffic	Minimal increases in noise would result from project-related traffic
<b>Traffic noise levels at gateway facility location exceed FHWA standard?</b>	No gateway facility would be built	Traffic noise levels at the facility would be 55 dBA - below FHWA criterion of 67 dBA	Traffic noise levels at the facility would be 66 dBA - below FHWA criterion of 67 dBA	Traffic noise levels at the facility would be 66 dBA - below FHWA criterion of 67 dBA	Traffic noise levels at the facility would be 66 dBA - below FHWA criterion of 67 dBA
<b>Plane and train noise levels at gateway location disruptive?</b>	No gateway facility would be built	Planes would continue to generate intermittent, noise at gateway site	Planes and trains would continue to generate intermittent, noise at gateway	Planes and trains would continue to generate intermittent, noise at kiosk	Planes and trains would continue to generate intermittent noise at kiosk
<b>Noise levels at surrounding uses exceed FHWA standard?</b>	Noise levels at homes north of I-84 west of Sandy River continue above FHWA standard	Noise levels at homes north of I-84 west of Sandy River continue above FHWA standard	Noise levels at homes north of I-84 west of Sandy River continue above FHWA standard	Noise levels at homes north of I-84 west of Sandy River continue above FHWA standard	Noise levels at homes north of I-84 west of Sandy River continue above FHWA standard

## **4.12 UTILITIES AND SERVICES**

### **4.12.1 Issues and Analysis Methodology**

Section 1.4.2 identified significant issues regarding the proposed improvements and development of the Sandy River Delta site which are relevant to a discussion of impacts to utilities and services, including:

- What measures will be instituted to control illegal uses and the effects of increased recreational use such as litter, vandalism, trespass, safety, parking, human waste, noise, etc.

- What will be the impacts of development on agencies that provide fire and emergency services to the site?
- What will be the affects on Lewis and Clark State Park? On the City of Troutdale?

In addition, Section 1.5 identified applicable regulatory requirements for all alternatives. Section 3.12 stated that the NSA Recreation Development Plan identifies provision of emergency, law enforcement, and fire services as major concerns for the Sandy River Delta site.

This section discusses each alternative in terms of these issues, planning guidelines and regulatory concerns.

The analysis of impacts to water supplies and requirements for wastewater treatment are based on estimates of water consumption and wastewater treatment volumes. Standard building codes and treatment design standards were taken into consideration as well as average duration of visitor stay. Impacts were determined to be adverse if an alternative would:

- Increase consumption of water beyond existing supplies.
- Require substantial expansion of wastewater treatment and distribution facilities.

Analysis of utility impacts were determined by comparison of existing utilities and proposed alternative site designs and estimated visitation. Impacts were determined to be adverse if an alternative would:

- Result in increased energy consumption requiring development of new sources.

Impacts to law enforcement and emergency services were determined through interviews with law enforcement officials. Impacts were determined to be adverse if an alternative would:

- Result in increased demand for services beyond the ability of the responsible agency to provide.
- Result in situations that decreases safety of visitors to site.

Regardless of the alternative, the area would receive increased use and demand on emergency/law enforcement services.

#### **4.12.2 Alternative 1 - No Action**

The no action alternative would result in no direct impact to existing utilities and services. Over time, fire and emergency service agencies would experience increased demand due to regional population growth, and related increases in recreational use of the site.

There would be no additional control of site usage to ensure attainment of SMA standards and no additional management of user conflicts. No additional control of illegal uses, litter, vandalism, trespass, safety, or treatment of human waste would occur with this alternative.

#### **4.12.3 Alternative 2**

This alternative would involve the greatest potential effect on utilities and services in the project area compared to the other alternatives because it involves the most extensive facility development and highest level of projected recreational use. The type and magnitude of the impacts will depend on which option is pursued to provide utilities and services.

##### ***Water Supply***

Water use would increase under this alternative and a reliable water supply would need to be established to support development of the gateway center, caretaker residence, and restoration facility. The Recreational Development Plan for the gateway facility prescribes a design capacity for 350 to 500 people at one time (PAOT). For a means of comparison, the maximum usage of 500 PAOT is assumed for Alternative 2, therefore, the water supply system should be able to accommodate 500 PAOT. Estimated water supply to accommodate a PAOT of 500 would be up to about 60 gallons per minute (gpm).

Although the spring on Broughton Bluff is a source of potable water, further analysis is needed to determine whether this is a dependable source capable of meeting the projected demand. This spring was tapped to serve the original farming use of the site. It is expected that the existing 100-gallon cistern would have to be expanded or supplemental storage would need to be constructed and pipes replaced to meet the expanded demand for water with increased recreational use of the site.

If further investigation indicates that the spring cannot meet the projected demand, even as a backup water supply, a well could be dug on the site. Based on similar sites in the area, there is a good potential for a successful water well. Another possible water supply which would require further investigation is piping water from the well which currently serves Lewis and Clark State Park. If this option were approved by OPRD, it would require improvements to the pump and the extension of a water line under the railroad and freeway.

The gateway facility could potentially be served by extending public water service from the City of Troutdale via the Sandy River Bridge to the site. This water line extension would



involve additional on- and off-site impacts associated with excavation and installation of a pipeline. It would also require an amendment to the City of Troutdale's Comprehensive Plan, and approval of the Boundary Commission.

The pipe which currently brings water from a spring on Broughton Bluff to the Delta area may be temporarily impacted during construction of the highway interchange and during construction the gateway and related structures. A temporary interruption in water supplies to current users could occur if the City of Troutdale water line were extended. There could also be some temporary interruption of water service during upgrades to the water system at Lewis and Clark State Park, if that option were chosen.

### *Wastewater Treatment and Solid Waste Disposal*

Increased use of the site would increase the need for restrooms and associated wastewater treatment facilities along with solid waste disposal services.

Management of wastewater is essential in order to protect surface water and groundwater on the site. An estimated 4,000 gallons per day (gpd) of wastewater would be generated by a PAOT of 500. Because of the high water table and poorly drained soils, a traditional septic system is not proposed for the site. Based on preliminary analysis, a composting design is proposed for the restrooms located at the north end of Sun Dial Island and east side of the Thousand Acres near the boat access. Wastewater treatment for the gateway facility and caretaker's residence could involve one or a combination of on-site treatment systems. A treatment wetland could be established to provide tertiary treatment along with a composting toilet. Another wastewater treatment option would involve construction of a rapid sand distribution system.

Public sewer service could be potentially be extended to serve the gateway facility and caretaker's residence with the approval of the City of Troutdale and the Boundary Commission. The existing line which services Troutdale Airport and Reynolds Aluminum plant could possibly be extended to the project site across the I-84 bridge. This option would involve off-site impacts associated with excavation and placement of a pipeline.

Solid waste would be removed under a contract with a private solid waste disposal service. Recycling would be encouraged by the placement of clearly marked recycling bins at the gateway facility.

### *Communications*

The overhead telephone lines and underground cable may be impacted during construction of the facilities and of the interchange improvements. Some lines, cables, and telephone poles may be relocated.

Extension of the telephone line to serve the caretaker's residence and gateway facility would be required. This service is currently above ground but NSA visual quality standards would require underground utility lines on the site.

### ***Electricity and Natural Gas***

Electrical service for the gateway facility and caretaker residence would be extended from existing power lines that follow the railroad right-of-way. This service is currently above ground but NSA guidelines would require underground lines to serve the facilities. Power lines may be temporarily affected during construction of the interchange and some poles may need to be relocated with short-term interruption of power during construction of the interchange improvements.

Extension of natural gas service would require construction of a line from Troutdale across the Sandy River. The cost of this extension is not warranted by the limited facility. Therefore, heating for the gateway would be electrical.

### ***Emergency/Law Enforcement Services***

Increased usage of the Delta site would increase calls for emergency services to the site, particularly during peak summer and fall months. Trail improvements and additional parking would make more areas of the site accessible to the public, both for permitted and for prohibited activities. Enforcement of separate trail designations would require additional monitoring and staff. The camping permitted in two locations could continue existing law enforcement problems associated with transient camping on the site. Camp fires would continue and possibly increase the risk of fire. These would offset to some degree by the increased accessibility for fire fighting equipment to remote areas of the site from improved trails. The emphasis on a mixture of vegetative types would not significantly affect the risk of fire.

Provision of 275 paved parking spaces is expected to decrease illegal parking. Vandalism of cars would be expected in parking areas that were not monitored on a regular basis. Locking the gate to the area north of I-84 at night would decrease some illegal activities.

While the presence of a full-time caretaker on the site would help alleviate some of the demands on law enforcement, unless the caretaker was a commissioned officer, law enforcement officials would still be required to issue citations and provide enforcement.

Improvements to roads and trails on the site would improve accessibility for emergency services and law enforcement over existing conditions. Trails would provide vehicular access for law enforcement personnel and the equestrian trail head would facilitate access for the Sheriff's posse. Emergency services to campers on Sun Dial Island and near the proposed boat moorings on the east side of the Thousand Acres subarea would be improved but could still be difficult due to the more limited access to these areas.

#### **4.12.4 Alternative 3**

Overall, this alternative would result in fewer impacts to utilities and services than Alternative 2 because this alternative encourages a lower intensity of use. The type and magnitude of impacts will depend on the option selected to provide utilities and services.

##### ***Water Supply***

Water use would increase over existing conditions with this alternative, although not as much as for Alternative 2. As with Alternative 2, reliable water supply would need to be established to support development of the gateway facility, restoration center and caretaker residence. For means of comparison, an estimated PAOT of 350 is assumed for this alternative. Water supply to accommodate PAOT of 350 would be about 40 gpm. See Section 4.12.3 for the discussion of water supply options.

##### ***Wastewater Treatment and Solid Waste Disposal***

Increased use of the site would increase the need for toilets and associated wastewater treatment facilities as well as solid waste disposal.

Wastewater treatment for the facilities under Alternative 3 would be provided by on-site systems. As with Alternative 2, the restoration center and caretaker's residence would utilize either a combination of composting toilets with a tertiary treatment wetland or an above-grade rapid sand distribution system because of the high groundwater and poorly drained soils. An estimated 2,800 gpd would be treated based on a PAOT of 350. A traditional underground septic system would be used for the gateway facility south of I-84 where the soils will support one. As a result, there would be no impact on existing wastewater treatment services.

Solid waste removal would be contracted with a private service. Recycling would be encouraged with well-marked recycling bins located on the site.

##### ***Communications***

Impacts to telephone lines would be the same as Alternative 2. See Section 4.12.3. Construction of interchange improvements and the realignment of Jordan Road could force relocation of existing lines and cables.

##### ***Electricity and Natural Gas***

Impacts of extending electrical and natural gas service would be the same as Alternative 2. Some lines and poles may be relocated during the construction of the project, with the potential for a temporary service disruption during construction of the site facilities and reconstruction of the interchange.

### ***Emergency/Law Enforcement Services***

Alternative 3 involves more recreational development than Alternatives 1 and 4, but less than Alternative 2, and thus is likely to generate fewer calls than Alternative 2. Calls would peak during summer and fall months. As with Alternative 2, trail improvements and additional parking would make more areas of the site accessible to the public, both for permitted and for prohibited activities. Improvements to roads and trails on the site would improve accessibility for emergency services over existing conditions and Alternative 4, but not to the extent that Alternative 2 would. However, the open landscape would improve oversight of visitor activities.

Since dispersed camping would be allowed, law enforcement efforts to control problems associated with transient camping on the site would continue to require monitoring the length of stay of individual campers. The open vegetative type emphasized in this alternative would allow for easier visual survey of the site.

Allowing camp fires would increase the risk of fire as would the generally increased accessibility to the site. The emphasis on establishment and maintenance of an open landscape would also increase the risk of fire during droughty summer months at the same time that the most intense use occurs.

Construction of 100 paved parking spaces north of I-84 and 75 on the ODOT triangle could decrease illegal parking. Vandalism of cars would be expected in parking areas that were not regularly monitored. Locking the gate to the area north of I-84 at night would discourage illegal activities.

While the presence of a full-time caretaker on the site would help alleviate some of the demands on law enforcement, unless the caretaker was a commissioned law enforcement official, other agencies would still be required for citations and enforcement.

#### **4.12.5 Alternative 4**

The limited recreational development proposed in Alternative 4 would result in fewer impacts to public services and utilities than the other action alternatives.

### ***Water Supply***

No impacts to water supply systems or need for additional water supplies are anticipated for this alternative because there would be no development north of I-84 and no facilities associated with the kiosk south of I-84.



### *Wastewater Treatment and Solid Waste Disposal*

No impacts to wastewater treatment facilities or need for additional treatment facilities are anticipated for this alternative. Removing the existing boat dock east of the Thousand Acres would reduce the sanitation problems associated with the use. No additional restrooms are proposed. Solid waste disposal services would be contracted with a private firm.

### *Communications*

Telephone lines and may be impacted during construction of the interchange improvements and result in temporary interruption of service. Some lines and telephone poles may be permanently relocated.

### *Electricity and Natural Gas*

Power may be interrupted for a short time during construction of interchange improvements. Electrical service would be extended to supply light for the kiosk; the distance is estimated to be less than 100 feet. This service is currently above ground and would involve placement of underground lines to the kiosk area. Extension of gas service would not be required for this alternative.

### *Emergency/Law Enforcement Services*

Because this alternative involves minimal improvements on the site, the requirements for emergency/law enforcement services would be less than for Alternatives 2 and 3.

Access for emergency and law enforcement purposes would be somewhat improved but not to the same level as with Alternatives 2 and 3. Enforcement of separate trail designations is not required with this alternative but enforcement of the prohibition on mountain bikes and equestrian use would be required. Since camping would not be allowed, this alternative would facilitate law enforcement efforts to control problems associated with transient camping. However, enforcement would require periodic patrols. Locking the gate to the area north of I-84 at night would decrease some illegal activities.

The slightly increased accessibility to the site would increase the fire risk while the emphasis on establishing a wooded landscape would greatly decrease the risk of fire on the site.

Establishment of additional parking spaces would decrease illegal parking. Vandalism of cars would be expected in parking areas that were not regularly monitored. Vandalism of the kiosk would be probable.

Additional trails would increase public accessibility to the site but not to the extent of Alternatives 2 and 3. The trail system would be less developed and the site would be more forested, reducing the visibility and cross-country access for emergencies and law enforcement.

Removing the boat dock from the east side of the Thousand Acres would discourage boat-in access to the site.

#### **4.12.6 Alternative 5**

Recreational development under Alternative 5 would be similar to Alternative 3, but the gateway would be a kiosk located south of I-84 and no camping would be allowed north of I-84, as in Alternative 4. Therefore, the demand for utilities and services is expected to be less than Alternatives 2 and 3, but more than Alternatives 1 and 4.

##### ***Water Supply***

A new water supply would be provided for the Restoration Center north of I-84, as described in Alternative 3. (Section 4.12.4). No water supply would be needed for the gateway kiosk.

##### ***Wastewater Treatment and Solid Waste Disposal***

The proposed Restoration Center and caretaker's residence would require on-site sewage disposal similar to Alternative 3, and would have similar impacts (Section 4.12.4). Portable restroom facilities would be provided adjacent to the relocated boat moorage on the east side of the site, at least during the summer months. This would solve sanitation problems on that part of the site. Solid waste disposal would be contracted with a private firm.

##### ***Communications***

Telephone service will be extended to the Restoration Center and caretaker's residence. Some existing lines may be affected during interchange construction, possibly resulting in temporary disruption of service. Some may be permanently relocated.

##### ***Electricity and Natural Gas***

Electrical service will be extended and lines placed underground to serve the Restoration Center, caretaker's residence, and kiosk. Natural gas would not be extended.

##### ***Emergency/Law Enforcement***

Emergency and law enforcement effects of this alternative would be the same as Alternative 3. (See Section 4.12.4)

#### **4.12.7 Cumulative Effects**

##### ***Water Supply***

Alternatives 2, 3, and 5 would involve establishing a water supply to the Delta part of the site. This could affect existing water supplies if either the Lewis and Clark State Park well or Troutdale water service is extended. However, the most practical and economically feasible option is drilling a new well on site. Well water withdrawals would impact the groundwater aquifer in that area although the amount withdrawn for the site would be minimal, and would be off-set by recharge from the treatment wetland.

##### ***Wastewater Treatment and Waste Disposal***

The need for wastewater treatment and waste disposal in the project area would increase with increased visitation under all alternatives. The NSA Management plan anticipated that wastewater treatment could be handled on site. However, if use of the site and facilities exceeds projections in the plan, it may be necessary to extend public sewer service from Troutdale. This would require an amendment to the City's Comprehensive Plan and approval of the Boundary Commission. The Troutdale Wastewater Treatment Plant was not sized to serve additional recreational facilities east of the Sandy River. Effluent from the site would not be a significant impact in itself, but when taken together with other developments in the city, a cumulative need to expand treatment capacity may result.

Removal of the boat dock east of the Thousand Acres in Alternative 4 would reduce recreational usage of that area and the sanitation problems associated with it.

##### ***Communications***

While telephone lines and underground cables may be impacted during construction and service may be interrupted for a short time, these impacts would be short term. The amount of additional load on the telephone service as a result of the proposed project would be minimal.

##### ***Electricity and Natural Gas***

There would be a minor increase in electricity use as a result of Alternatives 2, 3, 4, and 5. Natural gas service would not be impacted.

##### ***Emergency/Law Enforcement Services***

Increased use of the site combined with increasing use of nearby recreational facilities could result in a cumulative impact on emergency and law enforcement services. Other public parks in the project vicinity are day use only and gates are locked at dark. Increased levels of camping and trail use on the site could increase use and demand for services in the project vicinity to a higher level than available services can control. As proposed, Alternatives 2, 3

and 5 would contribute to the increase in demand of emergency/law enforcement services more than Alternatives 1 and 4.

#### **4.12.8 Mitigation Measures**

The following mitigation measures are proposed to reduce the impacts of project development on public services and utilities in the area.

##### ***Water Supply***

- 4.12 - 1. The spring supplying water to the Delta area would be protected. The pipe carrying water to the Delta would also be protected or replaced during construction.
- 4.12 - 2. All facilities would incorporate water conservation designs (low-flow toilets, etc.)

##### ***Wastewater Treatment and Waste Disposal***

- 4.12 - 3. Recycling would be encouraged by providing recycling bins at various site facilities.

##### ***Communications***

- 4.12 - 4. General Telephone, Paragon Cable and Sprint Fiber Optic Cable companies would be contacted and consulted to avoid interruption of service during construction of the site facilities or of the interchange improvements.

##### ***Electricity and Natural Gas***

- 4.12 - 5. Portland General Electric would be contacted and coordinated with to avoid interruption of service during construction of the site facilities or of the interchange improvements.
- 4.12 - 6. Energy conservation designs would be incorporated into all facilities.

##### ***Emergency/Law Enforcement Services***

- 4.12 - 7. An agreement would continue with the County Sheriff and State Police to provide additional services during peak use periods.



- 4.12 - 8. The presence of the caretaker along with the presence of staff at the gateway facility in Alternatives 2 and 3 would increase monitoring and control of illegal activities at the site. Also, the FS would increase regular patrols in the area.

#### **4.12.9 Summary**

##### ***Water Supply***

No substantial water supply impacts are expected with any alternatives. Alternatives 2, 3, and 5 would require development of a water supply for gateway facilities and/or the restoration center. Water currently piped under the highway from a spring on Broughton Bluff may potentially meet water supply needs. If that supply is not adequate, a well could be developed on the site or a connection to the well at Lewis and Clark State Park could be made. Connection to the City of Troutdale water supply may be possible if on-site supplies cannot be developed, but this would be an expensive option. The spring and the pipeline need to be protected during construction. Alternatives 1 and 4 would propose no additional water supply.

##### ***Wastewater Treatment and Waste Disposal***

No unavoidable significant effects on wastewater treatment systems are expected with any of the alternatives. Alternatives 2, 3, and 5 would require construction of restrooms and associated wastewater treatment. In order to avoid impacts to soils and groundwater, composting toilets, above-ground systems, and tertiary treatment are proposed on the north side of I-84. A traditional septic system could be constructed for the gateway in Alternative 3. Connecting to City of Troutdale sewer services may be considered for Alternative 2. Connecting to City services would involve impacts associated with excavation and placement of a new line, and would be very expensive. Alternatives 1 and 4 would propose no additional wastewater treatment.

All of the alternatives would include contracting solid waste disposal services for the site. Recycling would be encouraged through the placement of recycling bins at site facilities for all alternatives.

##### ***Communications***

No long-term effects on telephone services would be expected with any alternative.

##### ***Electricity and Natural Gas***

No long-term effects on telephone services would be expected with any alternative.

*Emergency/Law Enforcement Services*

Table 4.12-1 presents a summary of the effects on utilities and public services. The demand for emergency/law enforcement services is expected to increase under all alternatives. Alternatives 2, 3, and 5 could impact emergency/law enforcement services the most due to proposed site improvements. However, by improving roads and trails to the site, these alternatives could also improve access for emergency and law enforcement services. For Alternatives 2, 3, and 5 the 24-hour presence of a caretaker and presence of gateway staff during the day would increase control of the site and decrease the response time in the case of an incident. In, addition, auxiliary emergency services could be contracted during high use periods. Alternatives 1 and 4 propose no additional emergency or law enforcement services.

**TABLE 4.12-1  
SUMMARY OF UTILITIES AND SERVICES EFFECTS**

<b>EFFECTS</b>	<b>ALTERNATIVE 1</b>	<b>ALTERNATIVE 2</b>	<b>ALTERNATIVE 3</b>	<b>ALTERNATIVE 4</b>	<b>ALTERNATIVE 5</b>
<b>Need for new water supply, or adverse effect on existing water systems?</b>	No change from existing conditions	A water supply source and connections would be needed to serve the gateway and caretaker's residence (approx. 60 gpm needed)	A water supply source and connections would be needed to serve the gateway and caretaker's residence (approx. 40 gpm needed)	No change from existing conditions	A water supply source and connections would be needed to serve the restoration center and caretaker's residence (approx. 40 gpm needed)
<b>Need for new wastewater treatment facilities, or adverse effect on existing facilities?</b>	No change over existing conditions	Construction of restrooms & on-site wastewater treatment facilities needed (approx. 4,000 gpd estimated)	Construction of restrooms & on-site wastewater treatment facilities needed (approx. 2,800 gpd estimated)	No need for additional restroom facilities	Construction of restrooms & on-site wastewater treatment facilities needed (approx. 2,800 gpd estimated)
<b>Need for new communication system or, adverse effect on existing communications systems?</b>	No change over existing conditions	Need for new telephone and cable system to serve gateway facility, caretaker's residence and restoration center	Need for new telephone and cable system to serve gateway facility, caretaker's residence and restoration center	No need for communications system	Need for new telephone and cable system to serve gateway facility, caretaker's residence and restoration center
<b>Would increased demand for emergency services and law enforcement services exceed ability of agencies to provide?</b>	Over time, demand would increase due to regional growth of metropolitan area; no improvement to site access	Increased demand due to new recreational improvements and gateway facilities. Offset somewhat by improved access and presence of caretaker	Increased demand due to new recreational improvements and gateway facilities. Offset somewhat by improved access and presence of caretaker	Increased demand due to new recreational access to site via trails. Offset somewhat by improved access to Thousand Acres subarea	Increased demand due to new recreational improvements and gateway facilities. Offset somewhat by improved access and presence of caretaker

## **4.13 SITE CONTAMINATION**

### **4.13.1 Issues and Analysis Methodology**

This section addresses the potential for contamination of air, soil, vegetation and water resources on the site from hazardous or toxic substances, or for people and wildlife to be exposed to hazardous or toxic substances on the site as a result of the project alternatives. For the project area, potential sources of hazardous or toxic contaminants include fluoride emissions from the Reynolds aluminum plant across the Sandy River; EMF emissions from BPA's high-voltage transmission lines on the site; the NWPC high-pressure natural gas transmission line; exhaust emissions, oil, grease and heavy metals from motorized vehicles and equipment; and herbicide applications to control unwanted vegetation. Because only biological controls are being considered for mosquito control (no chemical controls are being considered), there would be no impacts. Mosquito control is discussed in Section 4.4.

An adverse effect would occur when the concentrations of hazardous or toxic substances exceed applicable standards or would be harmful to ST&E species; or when substantial increases would occur in the exposure of people, wildlife and ST&E species to such substances.

As discussed in Section 3.16, monitoring of the site's vegetation for fluoride contamination has been conducted for nine months every year in accordance with DEQ requirements, and will continue for as long as DEQ requires it. To date, no concentrations of fluoride beyond permitted levels have been found. Because no violations have occurred, and the project would not result in a change in the operations of the Reynolds plant or the monitoring of the site's vegetation, there would not be an increase in exposure to fluoride due to any of the project alternatives. Therefore, no further analysis of this issue is required.

The NWPC high-pressure natural gas line that crosses the Thousand Acres subarea of the Delta is buried 36 inches underground. Alternatives 1 and 4 would not propose any improvements in the vicinity of this gas line; and Alternatives 2, 3, and 5 would only create improved trail crossings of the gas line, but would not propose any subsurface development that could affect the gas line. Because none of the alternatives propose improvements that could potentially affect this gas line, no increased risk of explosions or exposure to a hazardous substance would occur. Therefore, no further analysis of this issue is required.

Exposure to exhaust emissions from motor vehicles traveling on I-84, has been evaluated in Section 4.10. As determined in that analysis, hazardous levels of exhaust emissions (as represented by CO) would not occur in the project area with any of the alternatives. Therefore, no further analysis of this issue is required.

The remaining potential sources of site contamination (EMF emissions; emissions from motor vehicles; and herbicides) are addressed for each of the alternatives in Sections 4.13.2 to 4.13.5



below. The following discussion of the herbicide "Rodeo" (which could be used with Alternatives 2, 3 and 5) will explain the characteristics of the herbicide as well as the methodology used to determine whether use of this herbicide would result in an adverse effect on visitors or wildlife.

### ***"Rodeo" Herbicide***

Alternatives 2, 3, and 5 propose to establish large amounts of upland or wetland meadow in areas currently infested with reed canarygrass and blackberries. The FS is proposing that an initial herbicide treatment be employed as a corrective action to reduce the infestation of noxious and invasive weeds presently found on the Delta. Additionally, Alternatives 3 and 5 would likely require a maintenance program using herbicides to control reinfestation of unwanted vegetation. Rodeo herbicide, produced by the Monsanto Company, is the only herbicide under consideration because it is a non-selective herbicide, and is specifically labeled for use in and around aquatic sites including all bodies of fresh and brackish water, either flowing or non-flowing. This includes lakes, rivers, seeps, irrigation and drainage ditches, canals, reservoirs, and similar sites. When applied according to label directions, residue levels in water will not exceed the acceptable level for the active ingredient of 0.5 ppm as established by the EPA (Monsanto, 1990). Mammalian toxicity of a pesticide is measured as the dose, expressed as milligrams (mg) per kilogram (kg) of body weight, which will theoretically induce mortality in 50 percent of the test animals (LD<sub>50</sub>). For Rodeo, the LD<sub>50</sub> for mammalian toxicity is 4,300 mg/kg making it practically nontoxic (Meister, 1992). For fish, the toxicity measure is the concentration of test material, expressed as milligrams (mg) per liter (l) of water, which will theoretically induce mortality in 50 percent of the test animals (LC<sub>50</sub>). For trout, the 96-hour LC<sub>50</sub> is greater than 1,000 mg/l, again meaning that Rodeo is practically nontoxic (Monsanto, 1990). Rodeo is non-volatile; once applied, the likelihood of transfer to non-target areas is minimized.

Potential impacts to surface and groundwater from a chemical depend on its ability to reach and move within the water and the toxicity of the chemical itself. There are a number of important chemical properties which influence the ability of the chemical to reach and move within the groundwater or contaminate surface waters. These include: soil adsorption, solubility, persistence, and formulation. When a herbicide is applied to vegetation, some will invariably contact the soil. When this happens some of the molecules will adsorb to the soil (mainly the organic fraction) and some will enter into solution. This is known as the soil water partition coefficient and is measured by the  $K_{oc}$  value. Herbicides with high  $K_{oc}$  values (>1,000) have a strong attachment to the soil and a lesser tendency to move through the soil to the water except with sediment transport. Herbicides with low  $K_{oc}$  values (300 to 500) will tend to move with soil water and have the potential for deep percolation. The solubility of a herbicide will strongly affect the ease of runoff and leaching through soil. In general, herbicides with a water solubility of 1 part per million (ppm) or less will tend to stay at the soil surface and may be lost in the sediment phase of surface runoff. The persistence of herbicides is represented by the half-life ( $K_d$ ). The longer a chemical persists, the greater the chance of movement into surface or groundwaters. Establishment of exact half-lives is



impossible. Half-lives vary depending on temperature, pH, oxygen status, soil microbial populations, and other factors. Chemical formulations affect the initial fate (hours to days) of herbicides. Wettable powders are about 30 times more likely to be lost than emulsified concentrates if applied to ground which is immediately subject to rainfall or irrigation (SCS, 1991). The SCS has developed a herbicide database which rates the potential of a chemical, based on the properties discussed above, to be lost through leaching or with surface runoff. Each chemical is given a rating of Large, Medium, or Small potential for leaching loss or surface runoff potential. Table 4.13.1 lists the rating for Rodeo and quantifies the properties.

**TABLE 4.13.1**  
**SCS DATABASE FOR RODEO HERBICIDE**

Chemical	Glyphosate Amine Soluble Salt
Trade Name	Rodeo
Manufacturer	Monsanto
Use	non-cropland, aquatic weeds
Formulation type	aqueous concentrated solution
Application mode	target plant foliar spray, wiper application
Solubility in water (ppm)	900,000 (estimate)
Half life in soil (days)	60
Soil adsorption index ( $K_{oc}$ )	24,000
Surface loss potential	large
Leaching potential	small

*Source: SCS National Pesticides/Soils Database, 1991*

The SCS has also rated all mapped soils as to their potential for soil leaching and surface runoff. These ratings are based on organic matter content, soil structure and texture, depth to water table, and hydrologic soil group. Each series is rated as having either a High, Intermediate, or Nominal Potential for leaching and surface runoff. SCS ratings for soils found on the Delta are found in Table 4.13.2.

These two parameters, chemical and soil properties, are combined into a soil/herbicide Interaction Rating matrix to determine if a given chemical on a given soil has a high potential for being lost, a low potential for being lost, or somewhere in between. The SCS Soil/Pesticide Interaction Rating matrix is found in Table 4.13.3.

Potential 1 indicates that an applied herbicide has a high probability of being lost via leaching or runoff. Potential 2 is a gray area. A chemical in this ranking has a potential for being lost. However, the possibility of loss is not as great as with Potential 1. A Potential 3 chemical has a very low probability of being lost and poses little threat to either the surface or groundwater resource. These ratings are independent of each other, so a chemical may have a Potential 1

for leaching loss and Potential 3 for surface runoff. All potentials are estimates of actual field conditions. The SCS Soil/Pesticide Interaction Rating for Rodeo use on soils found on the Delta is found in Table 4.13.4.

**TABLE 4.13.2**  
**SCS SOIL RATING FOR LEACHING AND RUNOFF POTENTIAL**

<i>SOIL SERIES</i>	<i>LEACHING POTENTIAL</i>	<i>RUNOFF POTENTIAL</i>
Dabney loamy sand	Nominal	Nominal
Faloma silt loam	Nominal	High
Faloma silt loam protected	Nominal	High
Haplumbrepts very steep	Nominal	High
Pilchuck fine sand	Nominal	Intermediate
Rafton silt loam protected	High	High
Riverwash	Nominal	Intermediate
Sauvie silt loam	Nominal	High

*Source: SCS National Pesticides/Soils Database, 1991*

**TABLE 4.13.3**  
**SOIL/PESTICIDE INTERACTION RATING**

<i>SOIL LEACHING &amp; RUNOFF POTENTIAL</i>	<i>PESTICIDE LEACHING &amp; RUNOFF POTENTIAL</i>		
	<i>Large</i>	<i>Medium</i>	<i>Small</i>
High	Potential 1	Potential 1	Potential 2
Intermediate	Potential 1	Potential 2	Potential 3
Nominal	Potential 2	Potential 3	Potential 3

Due to Rodeo's very high  $K_{oc}$  value, it is unlikely to leach through the soil profile and poses little threat to the area's groundwater resources. Of the soils occurring on the Delta only Rafton silt loam protected is rated as having a Potential 2 for leaching loss. This is due to the ponding which often occurs on these soils. Rafton silt loam protected occurs in the seasonal pond located in the southeast section of the Thousand Acres subarea.

Since Rodeo is so strongly adsorbed by soil particles, the chances for loss with the soil fraction of overland flow are increased. There is a high probability of surface loss (Potential 1) in Faloma silt loam, Faloma silt loam protected, Pilchuck fine sand, and Sauvie silt loam. On the Delta, Faloma silt loam is located in the northern half of Sun Dial Island and constitutes the majority of the west half of the Thousand Acres subarea, bordered to the west by Riverwash.

Faloma silt loam protected is located only in the western section of the I-84 right-of-way. Pilchuck fine sand is located along the perimeters of Gary, Flag, and Chatham islands. Sauvie silt loam constitutes the majority of the southern half of Sun Dial Island and occurs in the Thousand Acres in the southeast corner and in an approximately 1,500-foot wide band along the Columbia River, bordered to the west by Faloma silt loam. In these areas there is a high probability for surface runoff. Faloma silt loam and Sauvie silt loam constitute the vast majority of soils found on-site. Thus, there is a high probability for surface runoff of Rodeo over the majority of the Delta.

**TABLE 4.13.4**  
**SOIL/PESTICIDE INTERACTION RATING FOR RODEO ON DELTA SOILS**

<i>SOIL SERIES</i>	<i>LEACHING POTENTIAL</i>	<i>RUNOFF POTENTIAL</i>
Dabney loamy sand	Potential 3	Potential 3
Faloma silt loam	Potential 3 (*)	Potential 1 (*)
Faloma silt loam protected	Not Rated	Not Rated
Haplumbrepts very steep	Not Rated	Not Rated
Pilchuck fine sand	Potential 3 (*)	Potential 1 (*)
Rafton silt loam protected	Potential 2 (+)	Potential 2 (+)
Riverwash	Not Rated	Not Rated
Sauvie silt loam	Potential 3 (*)	Potential 1 (*)

\* = depth to seasonal high water table <6 feet    + = ponded  
Source: SCS National Pesticides/Soils Database, 1991

#### 4.13.2 Alternative 1 -- No Action

This alternative would not increase the exposure of people to hazards from EMF emissions from the BPA transmission lines. Nor would this alternative increase the number of motorized vehicles or equipment on the site that could leak or spill oil, grease or heavy metals. Therefore, no increases in site contamination or exposure to hazards would occur with this alternative.

In addition, herbicides would not be used in this alternative. Mosquitoes and noxious weeds would continue to be controlled by the use of biological controls. Therefore, site contamination by chemical pesticides or herbicides would not occur.

### 4.13.3 Alternative 2

#### *EMF Emissions*

This alternative would improve the trails on the site for hiking, mountain biking and equestrian use, and would extend the improved trails throughout the Thousand Acres and Sun Dial Island portions of the Delta. Even though many of these trails already exist in an unimproved condition today, it is expected that the improvement of the trails, along with the addition of the gateway and parking facilities on the site, would increase usage. Therefore, where the trails cross under the BPA transmission lines, a greater number of people would be exposed to EMF emissions than are exposed today. This would be considered an adverse effect of this alternative. To date, studies regarding the level of potential health risk from short-term exposure to EMF emissions are not conclusive. Therefore, this potentially adverse effect would not be considered significant. It is also possible that, with the more formalized trails, the number of points at which people would cross the transmission line easement would be reduced from the existing number of informal crossings since it is assumed that people would generally prefer the improved trails.

BPA has adopted a "prudent avoidance" policy and discourages land uses in its right-of-way which could increase human exposure to EMF emissions. Therefore, the length and the number of trail segments crossing under the transmission lines has been limited, and no other recreational, gateway or parking improvements are proposed within the BPA easement. Conceptually, however, the level of risk could be reduced by reducing the number of crossings of the transmission line easement, such as would occur with Alternatives 3 and 4. In addition, signage could be used to notify users of the trails regarding the potential health risks of extended exposure to EMF emissions.

#### *Motorized Vehicles and Equipment*

During construction of the recreational, gateway, and interchange improvements proposed with this alternative, there would be increased potential for water quality degradation from petroleum products that leak or spill from motorized vehicles and equipment present during construction. This effect could be reduced with the use of standard construction practices to limit and contain the leakage or spillage of petroleum products. These practices include appropriate vehicle maintenance practices and use of erosion control mechanisms to contain any spills. Erosion control is further discussed in Section 4.3.

In the long term, this alternative would add paved roads and parking lots on the Delta, and therefore, would increase the potential for oil, grease and heavy metals from vehicles to contaminate water resources on the site. The potential effects on water quality from road and parking lot runoff are addressed in Section 4.3. As discussed in that section, no significant long-term water quality degradation is expected since all runoff would be treated prior to discharge to wetlands or drainage courses on the site.



### ***Herbicide Application***

This alternative would maintain a large area of upland meadow, requiring a species conversion from the present infestation of noxious weeds to a more desirable native plant community. Conversions of this type are unlikely to succeed unless a corrective action aimed at controlling the present infestation is taken. Under this alternative, the corrective action would involve both mechanical (scraping the top layer of plants and soil off) and chemical controls. The chemical used would be Rodeo (see discussion about Rodeo in Section 4.13.1).

Short-term effects on site contamination would be limited to the application of Rodeo over infested areas. These areas include the Rafton silt loam protected soil located in the seasonal pond in the southeast section of the Thousand Acres. Here there is a potential for leaching loss. Over the majority of the remainder of the site where Faloma silt loam, Faloma silt loam protected, Pilchuck fine sand, and Sauvie silt loam soils occur the potential for surface loss of applied herbicide would be high. These potential impacts can be mitigated by timing applications to the dry season or clear weather and choosing a method application which minimizes runoff potential.

There would be no substantial long-term contamination of the site under this alternative. The half-life of Rodeo is estimated to be 60 days. Degradation of 90 percent of the product would occur within six months. Rodeo biodegrades into carbon dioxide, water, nitrogen, and phosphate. The principal metabolite, aminomethyl-phosphoric acid also degrades rapidly.

Since Rodeo is a non-selective herbicide, ST&E species populations could be affected by spray drift during the one-time application procedure. (See Section 4.4 for discussion of potential effects on these species.)

#### **4.13.4 Alternative 3**

### ***EMF Emissions***

This alternative would improve the trails on the site for hiking and mountain biking, and would extend the improved trails throughout the Thousand Acres and Sun Dial Island portions of the Delta although there would be fewer trail miles than in Alternative 2. Even though many of the proposed trails already exist in an unimproved condition, it is expected that the improvement of the trails, along with the addition of the gateway and parking facilities on the site, could increase usage. Where the trails would cross under the BPA transmission lines, and thus expose a greater number of people to EMF emissions than are exposed today, there would be an adverse effect. The level of risk could be reduced by reducing the number of crossings of the transmission line easement, such as would occur with Alternative 4. In addition, signage could be used to notify users of the trails regarding the potential health risks of extended exposure to EMF emissions.

### ***Motorized Vehicles and Equipment***

See discussion of short-term water quality effects from motor vehicles and equipment under Section 4.13.2.

Like Alternative 2, this alternative could have long-term effects on water quality due to the addition of paved roads and parking lots on the Delta. However, the potential for these effects would be reduced compared to Alternative 2 since the amount of new road and parking area would be reduced. The potential effects on water quality from road and parking lot runoff are addressed in Section 4.3. As discussed in that section, no long-term water quality degradation is expected since all runoff would be treated prior to discharge to wetlands or drainage courses on the site.

### ***Herbicide Application***

This alternative would require species conversion within a large area of upland meadow and also the conversion of upland meadow to wetland meadow. Because of the difficulty of achieving these types of conversions, this alternative is not likely to succeed without periodic use of herbicides, or long-term investments of time and labor. Because such a large area would be maintained as meadow, herbicide use would likely be necessary as part of a long-term maintenance program.

Short-term effects on site contamination would be identical to those outlined under Alternative 2. In addition, a long-term maintenance program with reliance on Rodeo to achieve landscape goals would increase the chances for surface runoff of the applied herbicide. Applications repeated over time would tend to accumulate the herbicide in the upper layers of the soil. With increased soil accumulation, the potential for leaching in the Rafton silt loam protected soil would increase.

The opportunity for negative impacts to ST&E species is present during each application. The increased number of applications under this alternative increase the likelihood of negative effects on these species (see Section 4.4 for discussion of ST&E Species).

## **4.13.5 Alternative 4**

### ***EMF Emissions***

Alternative 4 would have the fewest trails of all action alternatives, with none on Sun Dial Island. Formal trails would only cross under the powerlines at two locations on the Thousand Acres subarea with this alternative. Therefore, although some increase in exposure to EMF could result from the trails proposed it is the lest exposure of the build alternatives and would not be considered a significant effect.

### *Motorized Vehicles and Equipment*

There would be no roads open to regular vehicular traffic north of I-84. However, there would be an access road and parking lot to serve the information kiosk south of I-84. Therefore, there would be the potential for water quality effects from road and parking lot runoff, although it would be less than with Alternatives 2 and 3. No long-term water quality degradation is expected since all runoff would be treated prior to discharge.

### *Herbicide Application*

Herbicides would not be used under this alternative. Site contamination by herbicide use would not occur. Noxious weeds would continue to be controlled by the use of biological and/or mechanical controls. The establishment of a forest cover or scrub-shrub canopy over as much of the Delta as possible, would eventually reduce the amount of favorable environment for reed canarygrass.

## **4.13.6 Alternative 5**

### *EMF Emissions*

The trail system in Alternative 5 would be similar to Alternative 3, and the effects of EMF exposure on recreational visitors to the site would be the same. (See Section 4.13.4).

### *Motorized Vehicles and Equipment*

Alternative 5 proposes access improvements and parking similar to Alternative 3, and the environmental effects would be the same. (See Section 4.13.4).

### *Herbicide Application*

Both an initial, and ongoing applications of herbicides would be used to achieve the desired landscape pattern on the Thousand Acres. The effects would be similar to Alternative 3, although the area affected would be less than with Alternative 3. (See Section 4.13.4). After an initial application, herbicides would not be used on Sun Dial Island. The establishment of forest cover on scrub-shrub canopy would not be favorable for reed canarygrass. Blackberries could be controlled by manual and mechanical means.

#### **4.13.7 Cumulative Effects**

##### ***EMF Emissions***

Cumulative effects from exposure to EMF emissions cannot be evaluated in the scope of this EIS since it would be different for every person, and would depend on other sources of EMF that they are exposed to.

##### ***Motorized Vehicles and Equipment***

No adverse cumulative effects on site soil or water quality are expected to occur with the alternatives since any new sources of water pollution would be treated prior to discharge.

##### ***Herbicide Application***

Site contamination cumulative effects would be confined to areas subject to repeated use of herbicides in a long-term vegetation maintenance program. Repeated use of Rodeo over an extended period of time could result in minor soil accumulation of the product. With increased usage, the potential for accidental spills would increase resulting in localized areas of high herbicide concentration. These areas would be subject to leaching and runoff loss due to the sheer volume of material involved. Cumulative risk of site contamination would occur only with Alternatives 3 and 5.

#### **4.13.8 Mitigation Measures**

##### ***EMF Emissions***

- 4.13 - 1. Signage should be placed in each direction along the trails that cross under the BPA transmission lines that warn of the potential health effects of prolonged exposure to EMF emissions.
- 4.13 - 2. The length of trail under the BPA transmission lines should be limited to the minimum needed to cross the easement at each location.

##### ***Motorized Vehicles and Equipment***

Standard construction practices that would be required of all contractors would limit the potential for contamination from leaks or spills of oil, grease and heavy metals to a non-significant level. Therefore, no additional construction measures are required.

Also, measures incorporated into the drainage system for each of the action alternatives would reduce the potential for contamination from oil, grease and heavy metals from motorized



vehicles and equipment to a less than significant level. Therefore, no further long-term measures are required (see Section 4.3).

### ***Herbicide Application***

In order to mitigate the potentially adverse effects of proposed vegetation control actions, several measures should be taken. These measures taken as a whole would reduce the potential for adverse effects to surface water resources and possible adverse effects to ST&E species.

- 4.13 - 3. Do not apply herbicide if rainfall is imminent. If rainfall occurs within six hours of application, Rodeo could be washed off the treated vegetation and increased surface runoff would be likely. If washed off, the effectiveness would be reduced and a second application may be necessary.
- 4.13 - 4. Apply herbicide only during calm conditions to avoid wind drift to non-target species. This could require early morning applications when the potential for afternoon winds is probable. Avoid combinations of spray pressure and nozzle types which would be likely to produce fine spray particles subject to drift.
- 4.13 - 5. Institute an integrated vegetation management program including establishment of threshold levels and monitoring so that Rodeo is applied only when and where needed. The monitoring program would be implemented by qualified FS personnel.
- 4.13 - 6. Reduce the potential for spills by employing a closed system for metering the herbicide to the spray tank. Spray tank rinsate should be sprayed over target weeds and not dumped in one place.
- 4.13 - 7. Apply only to actively growing weeds. Applications to dormant or stressed vegetation would be less effective and may require an additional application.
- 4.13 - 8. Establish minimum 200-foot radius, no-spray buffers around all known populations of ST&E species. Use mechanical or biological controls in these areas.
- 4.13 - 9. When applying herbicides to the banks streams of moving water, always spray one bank at a time while traveling upstream to prevent herbicide concentration build-up in the water.

#### **4.13.9 Summary**

##### ***EMF Emissions***

Since an increase in the number of people using the site is expected with all the action alternatives, it is expected that these alternatives would lead to an increased number of people being exposed to EMF emissions from the BPA high-voltage power transmission lines that cross the site. This would be considered a potentially adverse environmental effect. To date, however, there is no conclusive evidence that short-term exposure to high levels of EMF emissions would be detrimental. However, it is recommended that the length of each trail crossing under the powerlines be designed to be as short as possible, and that signage be placed in each direction of each trail that approaches the powerlines to warn people of potentially harmful effects of prolonged exposure to high levels of EMF emissions.

##### ***Motor Vehicle and Equipment***

No substantial water quality effects would be expected with any of the alternatives since all runoff from the roads and parking areas would be treated prior to discharge. See discussion in Section 4.3.

##### ***Herbicide Application***

Alternatives 2, 3, and 5 would require an initial herbicide treatment employed as a corrective action to control the present infestation of noxious and invasive weeds. Additionally, because of the vast acreage of meadow proposed in Alternatives 3 and 5, these alternatives would likely require additional herbicide applications as part of an on-going maintenance program. Rodeo, the only herbicide proposed, is a non-selective herbicide labeled for aquatic sites and has a low potential for leaching into the groundwater but an intermediate to high potential for loss with the sediment phase of surface runoff. The product is non-volatile, almost non-toxic and has a 60-day half-life.

Adverse effects to surface waters could occur in conjunction with spills, or numerous sprays repeated over time. ST&E species populations could be impacted by drift during the application procedure if a buffer is not established.

Several measures are outlined which would successfully mitigate adverse effects. Table 4.13.5 presents a summary of the effects of the alternatives on site contamination.

**TABLE 4.13.5**  
**SUMMARY OF POTENTIAL SITE CONTAMINATION EFFECTS**

<i>EFFECTS</i>	<i>ALTERNATIVE 1</i>	<i>ALTERNATIVE 2</i>	<i>ALTERNATIVE 3</i>	<i>ALTERNATIVE 4</i>	<i>ALTERNATIVE 5</i>
Increase in number of people exposed to EMF emissions from BPA power transmission lines.	No change from existing conditions	Increase in numbers of people exposed short-term to EMF emissions	Increase in numbers of people exposed short-term to EMF emissions	Increase in numbers of people exposed short-term to EMF emissions	Increase in numbers of people exposed short-term to EMF emissions
Increase in oil, grease and heavy metals in water due to construction activities and increased presence of motorized vehicles and equipment.	No change from existing conditions	Mitigate with standard construction practices and proposed treatment of runoff from roads and parking areas	Mitigate with standard construction practices and proposed treatment of runoff from roads and parking areas	Mitigate with standard construction practices and proposed treatment of runoff from roads and parking areas	Mitigate with standard construction practices and proposed treatment of runoff from roads and parking areas
Soil contamination from use of Rodeo herbicide?	No change from existing conditions	Negligible increase in soil contaminants from initial application	Repeated applications of herbicide for noxious weed control	No herbicide use under this alternative	Repeated applications of herbicide for noxious weed control
Groundwater pollution from use of Rodeo herbicide?	No change from existing conditions	One time application of herbicide with low probability to leach	Repeated applications of herbicide with low probability to leach	No herbicide use under this alternative	Repeated applications of herbicide with low probability to leach
Surface water pollution from use of Rodeo herbicide?	No change from existing conditions	One time application of herbicide with high probability for surface runoff	Repeated applications of herbicide with high probability for surface runoff	No herbicide use under this alternative	Repeated applications of herbicide with high probability for surface runoff
Potential for drift onto ST&E species during application of Rodeo herbicide?	No change from existing conditions	One time application of non-selective herbicide	Repeated applications of non-selective herbicide	No herbicide use under this alternative	Repeated applications of non-selective herbicide

## **5.0 SUMMARY OF PROBABLE ADVERSE EFFECTS THAT CANNOT BE AVOIDED**

Implementation of any of the action alternatives could result in some adverse impacts which cannot be fully avoided. These specific impacts and proposed mitigation are discussed in Chapter 4. Even with the application of the proposed mitigation, some physical and cultural resources in the project area cannot be maintained or returned to existing conditions.

Some adverse and unavoidable effects would be expected if the no action alternative is selected and current conditions are allowed to continue.

It is important to recognize that the analysis in this EIS is at a planning level which will provide direction for development of site-specific design details as the selected alternative is implemented.

### ***Threatened and Endangered Species***

Increased boating along the Columbia River would be encouraged by boat access improvements under Alternative 2. This increased activity may affect the pair of bald eagles that nest nearby. The construction of boat moorings and steps under Alternative 2 for improved beach access may affect designated critical habitat for listed salmonids.

### ***Cultural Resources***

If Alternative 1 is selected, erosion at the archaeologic site 35MU76 and subsequent damage to the resource would continue. Alternative 1 would also result in continued deterioration of the historic diversion dam.

Alternative 2, which would increase boating use of the east side of Thousand Acres, may adversely affect site 35MU76.

### ***Land Uses and Planning***

Selection of Alternative 1 would not be consistent with the direction of the NSA Management Plan or the OPRD Gorge District Plan and it would result in continued adverse levels of recreational demand on Lewis and Clark State Park.

### ***Recreation***

Selection of Alternative 1 would not result in development of a gateway facility or realization of the interpretive or recreational access objectives of the Recreation Development Plan for the site.



Selection of Alternative 3, 4, or 5 would result in elimination of the informal parking area south of I-84 which currently serves Lewis and Clark State Park. This unimproved parking would be replaced with a paved parking area of fewer parking spaces. However, Alternatives 2,3, and 5 would provide a net gain of parking spaces if the entire site is considered.

Conflicts among recreation users would increase with increased use and minimal management under Alternative 1. All of the action alternatives would restrict or prohibit some existing uses in order to reduce conflicts between recreation and natural resources. Alternative 2 would eliminate hunting on the site and restrict other uses in order to reduce conflicts. Alternative 3 would prohibit equestrian use and restrict other uses to reduce conflicts. Alternative 4 would prohibit camping, equestrian and mountain bike use, remove the boat dock on the east side, and place restrictions on other recreational uses in order to reduce conflicts with natural resource enhancement. Alternative 5 would prohibit camping and equestrian use and restrict other uses.

### *Noise*

Visitors outdoors would experience potentially significant intermittent plane noise under all alternatives.

### *Utilities and Services*

Due to projected increases in visitation and no change in site accessibility or emergency and law enforcement services under Alternative 1, visitors could experience unsafe situations at the site.

## **6.0 SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY**

Short term and long term impacts of the alternatives are discussed in Chapter 4. Short term uses influence the present experience of visitors to the site and impacts on the environment in the project area. Long term impacts are more lasting and will influence future stability and productivity of the environment of the project area. There are often trade-offs between short term and long term benefits or impacts. For example: developing a gateway facility that will meet the demands of future visitors may involve a short term disruption to present visitors.

There would also be a potential for direct, indirect, and cumulative short term effects on soils from vegetation clearing, construction, and trail building. In the long term, chronic erosion, compaction, and sedimentation may decrease and water quality increase as a result of landscape enhancement to the site.

Habitat for some species may be disrupted in the short term as vegetation control measures (particularly grading, flooding, and fire) are instituted but improved in the long term. Habitat for some species may be improved while, at the same time, degrading habitat for other species. Section 4.4 discusses the wildlife impacts of each landscape pattern.

The cost of improvements may be delayed or altogether avoided. However, the short-term benefit of saving money would be off-set by long-term losses of recreation opportunities on the site, long term erosion and compaction of soils, and long term degradation of habitat for early seral species, particularly open habitats.



## **7.0 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES**

Irreversible commitments of resources are actions which disturb either a nonrenewable resource (e.g. cultural resource or extinction of a species) or a resource which can only be renewed in a period of time greater than 100 years, if ever (e.g. mineral source). An irretrievable commitment of resources applies to a loss of production, harvest or use of a renewable natural resource. It is the opportunity which is foregone for one use (e.g., mineral exploration or timber production) on a project site when the area is designated and developed with another use (for example, housing or recreational facilities). An irretrievable impact can be reversed with a change in management direction but an irreversible commitment cannot be reversed.

Both irreversible and irretrievable impacts would result from the implementation of the proposed development. These impacts are described below for each alternative.

### **7.1 IRREVERSIBLE COMMITMENTS OF RESOURCES**

The irreversible commitments of resources likely to result from implementation of the proposed project would be the same for all alternatives, although the magnitude of the impacts would vary.

None of the action alternatives would result in destruction or significant impacts to identified historic, cultural or natural resources. Implementation of any of the action alternatives would result in the use of construction materials to reconfigure the Jordan interchange and construct the trails, picnic areas, boat ramp, access road, parking and Gateway. The gravel, timber, metal, etc. used in this construction would then not be available for other uses. However, use of this site for public recreation was established in the NSA Management Plan, and completion of the Gateway was given a high priority.

### **7.2 IRRETRIEVABLE COMMITMENTS OF RESOURCES**

Selection of any action alternative would commit the site and public resources to a particular pattern of use and foreclose other land use and investment opportunities. The site would not be used for agriculture or mining (as it has in the past), but for recreation. The irretrievable commitment of resources for each alternative is described below.

#### **7.2.1 Alternative 1**

Under this alternative, no action would be taken to direct the landscape pattern of the site, and natural selection would be allowed to proceed. As a result, there would be minimal



commitment of resources to alter the landscape pattern. However, the opportunity to maintain an open habitat serving migrating waterfowl or develop a forested flood plain supporting species dependent on that habitat would be foregone. The opportunity to enhance recreational use of the gorge and recreational access to the Sandy and Columbia Rivers would also be foregone.

However, Alternative 1 would not commit scarce highway construction funds to the reconfiguration of the Jordan interchange, and other projects in the NSA or elsewhere in the State of Oregon could be constructed.

### **7.2.2 Alternative 2**

Implementation of this alternative would result in the greatest diversity of habitat on the site. It would also result in the most recreational development and use of the site. Introduction of more recreational users to the site would foreclose the opportunity to introduce or encourage species which avoid human contact to the site unless recreational use were reduced. The opportunity would be foregone to create a large block of forested or open habitat to support sustainable communities of species common to and reliant on these habitats as long as the diverse landscape is maintained. Compaction along trails and roads could result in irreversible damage as long as the facility exists and is used.

Selection of Alternative 2 would also involve the commitment of financial and physical resources to the improvement of the Jordan interchange and realignment of Jordan Road. Other road improvement projects could not be undertaken, or at least not as soon, as a result.

### **7.2.3 Alternative 3**

If the vegetative management strategy prescribed in Alternative 3 is selected, the opportunity to restore the site to a condition approximating that found when Europeans first explored the area (i.e., a forested Columbia River bottomland) would be foregone for as long as that landscape pattern is maintained. As a result, the site would not support forest-dependent species.

Selection of this alternative would result in less recreational development, foreclosing the opportunity to accommodate some of the projected demand on the site. The impacts of interchange improvements would be similar to those in Alternative 2.

### **7.2.4 Alternative 4**

If Alternative 4 is selected, the opportunity to maintain an open landscape and enhance open water on the site would be foregone for as long as the forested landscape pattern is maintained.

Use of the site by migrating waterfowl would be reduced or foreclosed. Visual resources may be irretrievably impacted by forestation of the site.

Selection of this alternative would result in minimal recreation facility development, foreclosing the opportunity to accommodate some of the projected demand on the site. The impacts of interchange improvements would be similar to those in Alternative 2.

#### **7.2.5 Alternative 5**

Alternative 5 would not reforest the entire site, and so would forego the opportunity to recreate a landscape pattern which existed before European settlement. At the same time, it would not maximize open habitat to support migrating waterfowl, and so would forego the opportunity to meet more of that need.

The moderate level of recreational development proposed would forego the opportunity to meet a greater portion of existing and future regional demand. It would, however, increase human-wildlife interactions and forego the opportunity to provide habitat for species that avoid human interaction.

The impact of interchange improvements would be similar to Alternative 2. Construction of a gateway kiosk would forego the opportunity to provide enhanced education about the NSA and to direct visitors to less-used areas that would occur with a staffed facility.



## 8.0 COMPLIANCE WITH SECTION 4(F) AND SECTION 6(f) REQUIREMENTS

### 8.1 INTRODUCTION

Section 4(f) of the Department of Transportation Act (23 USC Section 138) requires the USDOT and other agencies using USDOT funds to "use maximum effort to preserve Federal, State and local government parklands and historic sites and the beauty and historic value of such lands and sites". No program or project which uses land from a public park, recreation area, wildlife or waterfowl refuge or historic site may be approved unless it is shown that (1) there is no feasible and prudent alternative to the use of such land and (2) the proposed project or program includes all possible planning to minimize harm to the resource in question. The improvement of the Jordan Road Interchange may affect historic and recreational resources and require the use of public park lands. Therefore, Section 4(f) requirements apply to this project.

Section 6(f) of the Land and Water Conservation Fund Act prohibits the conversion of property acquired or developed with grants from the Land and Water Conservation Fund (L&WCF) to non-recreational purposes without the approval of the U.S. Department of Interior National Park Service (NPS) and unless replacement lands of equal value, location, and functional usefulness are provided as conditions of such conversions. OPRD indicates that L&WCF monies were used to improve the unpaved parking lot on Jordan Road between the UPRR and I-84. Therefore, Section 6(f) evaluation, consultation, and replacement requirements may apply to this project.

Because the requirements of these laws overlap, FHWA regulations permit the documentation of compliance with Section 4(f) and Section 6(f) to be combined. This section describes the resources that may be affected by the proposed project, the alternatives considered, potential impacts, proposed mitigation, and coordination that has occurred with responsible agencies. In order to minimize duplication, reference to other sections of this EIS is used wherever possible.

Section 1.0, *Purpose, Need and Related Planning* describes the need for both interchange improvements and proposed improvements to National Forest land on the Sandy River Delta. The two are interrelated because Jordan Road and the interchange on I-84 as it exists today does not meet AASHTO standards, and the proposed FS improvements to recreational facilities will increase traffic through the interchange and on Jordan Road.

The proposed action is the reconstruction of Jordan Road and interchange with I-84 to AASHTO standards in order to accommodate expected traffic to the Gateway and proposed recreational facilities. The project includes widening the bridges over the Sandy River (one in each direction) to provide a merge lane for traffic from the Graham Road interchange, and the realignment of Jordan Road. A description of the alternatives under consideration is contained in Section 2.0.



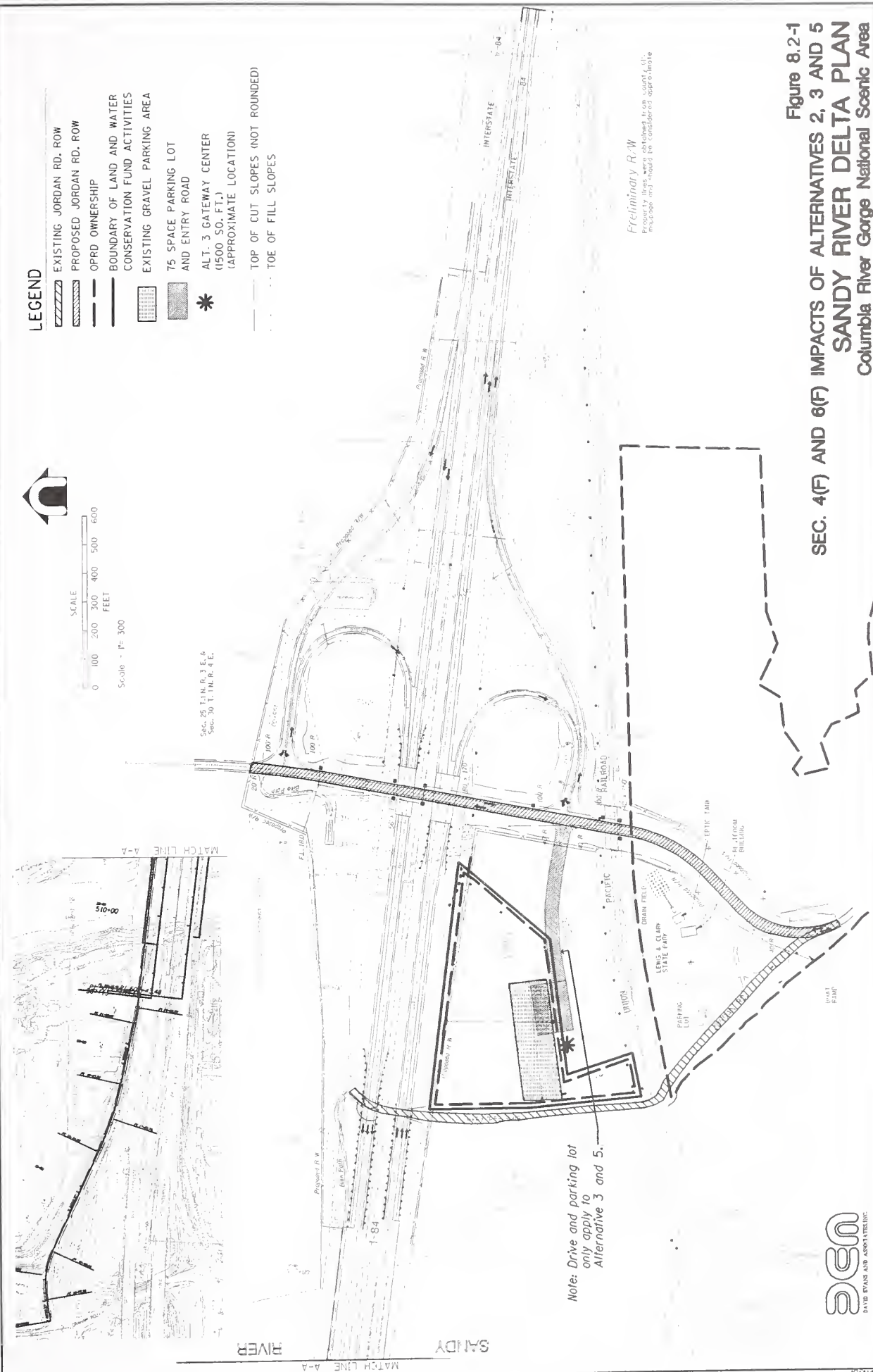
## **8.2 DESCRIPTION OF RESOURCES**

All of the land in the study area, except two acres owned by NWPC and the UPRR right-of-way, is publicly owned. All of the land surrounding the existing and proposed interchange locations is designated on the NSA Management Plan and Multnomah County Comprehensive Plan for Public Recreation. At the time that the interchange and Lewis and Clark State Park were developed, all property south of I-84 was held by the Oregon State Highway Department which included the Parks and Recreation Division. As a result, the land in Lewis and Clark State Park and the interchange were not differentiated. The Highway Department has since been replaced by ODOT and OPRD, and the property that they held has been divided among the agencies responsible for its management. Figure 8.2-1 shows identified Section 4(f) and Section 6(f) resources which may be affected by Alternatives 2,3, and 5. Figure 8.2-2 shows resources affected by Alternative 5. Chapter 3.5 describes cultural resources in the area in detail.

Detailed information on the study area is provided in the written journals of Meriwether Lewis and William Clark when they and members of their expedition traversed the area in November, 1805 and March and April, 1806. Their journals noted that the area abounded with wildlife at that time, however no camp sites or villages were noted. Several villages along the Columbia River appeared to have been abandoned, and when the remaining inhabitants were questioned about what had become of the former occupants, it was explained that they had died from a disease that left pox marks on those that survived the illness. Exposure to European diseases may have substantially reduced the population along the river before Lewis and Clark arrived. Site No. 35MU76, which is eligible for the National Register of Historic Places (NRHP), may have been abandoned prior to Lewis' and Clark's visit. Despite anecdotal reports of a Native American village or encampment which was buried by a landslide on Broughton Bluff, no evidence has been found in archaeological surveys of the area.

Settlement in the area occurred first on the west bank of the Sandy River, with a ferry providing connection across the Sandy to lands further east. Ferry transportation across the Sandy River persisted until about 1900. The ferry landing connecting to the historic road on the east side of the Sandy River was sited in the vicinity of the Lewis and Clark boat landing. All evidence of this landing has disappeared. By 1881, a house and farm buildings were located at the base of Broughton Bluff, on what are now the grounds of Lewis and Clark State Park.

The property remained in private hands until the 1950's when the southern portion was purchased for the construction of Interstate 84. At that time, the house and farm buildings were removed, and in 1961 a campground with 13 tent sites was constructed on the site of the Hicklin ranch buildings. The campground was later expanded to 22 sites with fire pits. In 1978, the campground was removed, dirt fill was brought in, and new trees and grass were planted to create the current Lewis and Clark State Park landscape. No evidence of the Hicklin homestead or ranch buildings has been found. Because of the disturbed nature of the Hicklin historic archaeological site, the FS recommended to the State Historic Preservation Officer



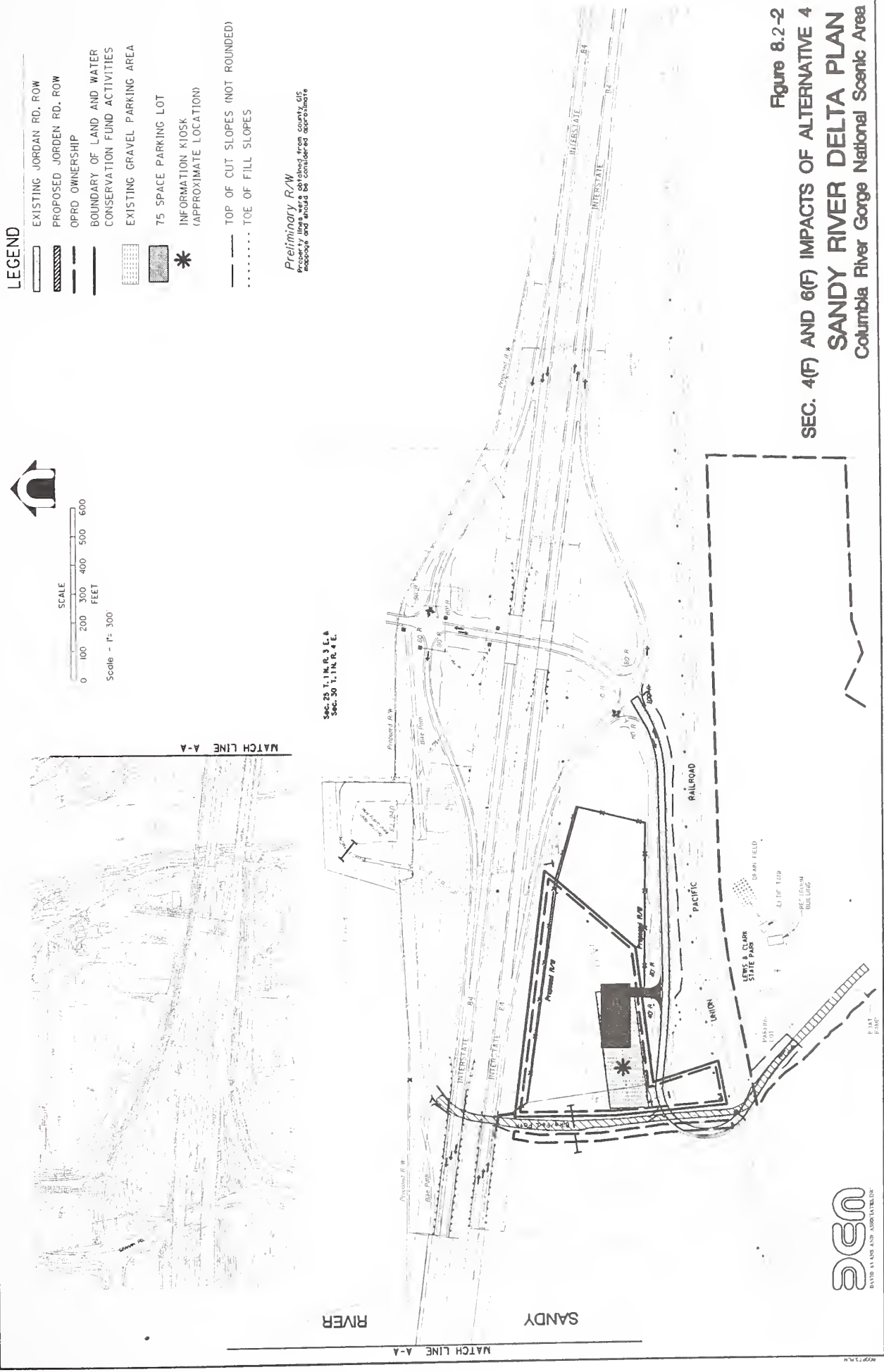
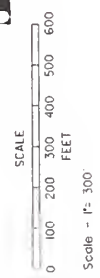
*Preliminary Raw*  
Property lines were obtained from county (sic) mortgage and should be considered approximate



# LEGEND

- EXISTING JORDAN RD. ROW
- PROPOSED JORDAN RD. ROW
- OPED OWNERSHIP
- BOUNDARY OF LAND AND WATER
- CONSERVATION FUND ACTIVITIES
- EXISTING GRAVEL PARKING AREA
- 75 SPACE PARKING LOT
- INFORMATION KIOSK (APPROXIMATE LOCATION)
- TOP OF CUT SLOPES (NOT ROUNDED)
- TOE OF FILL SLOPES

*Preliminary R/W*  
 Proposed state county cut  
 property and would be considered approximate



**Figure 8.2-2**  
**SEC. 4(F) AND 6(F) IMPACTS OF ALTERNATIVE 4**  
**SANDY RIVER DELTA PLAN**  
 Columbia River Gorge National Scenic Area





(SHPO) that it is not a significant resource, and SHPO concurred. The part itself is a Section 4(f) resource, however.

The ORNC Columbia River main railroad line (now owned by UPRR) was completed through the site in 1882 to link the Columbia River Gorge to Portland, the Willamette Valley, and the eastern states. The railroad remains in the same location as when it was constructed more than 100 years ago and the bridge over the Sandy River is one of two of the type remaining on the line today. SHPO has determined that the rail line and bridge are eligible for the NRHP.

### **8.2.1 Section 4(f) Resources**

Two resources remaining on the site have been identified as potentially requiring review under Section 4(f) of the Department of Transportation Act. The ORNC railroad line has been evaluated by a professional historian who recommended that it is eligible for the NRHP as a linear historic district and a significant historic resource. SHPO has concurred. Lewis and Clark State Park is a public park serving the recreational needs of the Portland metropolitan area as well as residents of surrounding communities. A description of each follows.

#### ***Lewis and Clark State Park***

Lewis and Clark State Park is a public park managed by OPRD that covers approximately 54 acres and includes a landscaped area with 41 picnic units, a restroom, a 125-space paved parking lot, and a boat ramp on the Sandy River. Broughton Bluff on the south side of the park is used for recreational climbing, and the Lower Elevation Gorge Trail trailhead is located at the base of the bluff on the east side of the park. Primary usage of the park is for Sandy River access. River uses include boating, fishing, and swimming, although no lifeguard is on duty and the swift and changing currents are a hazard even to strong swimmers. Hiking and climbing are important but secondary recreation uses. The parking lot is used informally by groups touring the Gorge as a rendezvous and place to begin carpools. In 1993-94, total day use attendance was 286,996. Park usage varies from month to month, with summer and fall being the highest usage periods (over 30,000 visitors per month). Recreation resources and recreation demand in the area are further described in Section 3.7.

Lewis and Clark State Park is a triangular park bounded by major physical barriers which shape its current and future use. There is limited potential to expand the park or add uses, due to these barriers. Broughton Bluff and the Sandy River are both the physical barriers and the recreation opportunities which draw people to the area. Expanding the park to the south along the river is not feasible, because the narrow area between the river and the bluffs is occupied by Jordan Road. Expansion to the north is blocked by the UPRR.

There are other parks and recreational facilities on the Sandy River in the area including Troutdale City Park (approximately one mile upstream), Dabney State Park (approximately six miles upstream), and Oxbow County Park (approximately nine miles upstream). Blue Lake

Park is located approximately 2.2 river miles downstream on the Columbia River. Section 3.7 discusses the recreational facilities in the area.

### ***Oregon Railway and Navigation Company Railroad***

As noted above, the ORNC Columbia River main line was completed in 1882, and connected with the Northern Pacific main line in one of the first transcontinental routes connecting the Pacific northwest with the eastern United States and securing Portland as a major trading center. The line was reconstructed in stages in the first two decades of this century. The sections of the ORNC line adjacent to Lewis and Clark State Park retain the original alignment, although the railroad was largely realigned through the Gorge when the Columbia River dams were constructed. The period of historical significance for the railroad is 1900 to 1940, when the original rail line was replaced with more permanent facilities. Even though the rails, ties, and fasteners have been changed over time due to wear and the use of heavier equipment, the approximate 1.2 mile section through the Sandy River Delta study area retains its integrity of roadbed, representing the 1882 alignment. The railroad is still in use by UPRR. The FS recommended that the railroad line be considered eligible for the NRHP as a linear historic district, and SHPO concurred (10/94).

The Troutdale railroad bridge, constructed in 1906, was recommended by the FS as significant as a contributing feature to the linear historic district. The SHPO concurred. The bridge is one of two Through-Truss type bridges (Warren configuration) remaining on the ORNC main line from Hermiston to Portland which remain from the historic period. The bridge is composed of three 150-foot trusses with a 60-foot deck plate girder on the western end (Welsh, 1994). Because of the limited number of these bridges remaining on the western section of the ORNC main line, the bridge may be eligible for the National Register as a single structure. The bridge abutment, which is adjacent to Jordan Road, is considered a part of this historic structure.

### ***National Forest Land***

National Forest land, such as the Thousand Acres subarea north of I-84, is considered multi-purpose land under Section 4(f) unless it has recreation facilities or is used for recreation. There are no developed recreational facilities on the National Forest land in this area currently and the land is not considered a Section 4(f) resource. The proposed interchange improvements will facilitate the development of trails and supporting recreational and interpretive facilities on the site. There are an archaeological site and one historic resource located on National Forest land both of which are eligible for the NRHP. Neither will be affected by the proposed road and interchange improvements.

### **8.2.2 Section 6(f) Resources**

OPRD reports that grant number OP1327 (NPS Project No. 4100952) from the L&WCF was used to construct the gravel parking area with guardrail, curbs, and traffic control posts which is located between the railroad and I-84. As a result, the two parcels of land between UPRR and I-84 were put under Section 6(f) protection. No L&WCF money has been used on projects in Lewis and Clark State Park itself, and the park is not designated a Section 6(f) resource.

## **8.3 ALTERNATIVES AND THEIR EFFECTS OF 4(F) AND 6(F) RESOURCES**

Chapter 2 of this EIS describes the alternatives, the process followed to develop them, and suggested alternatives eliminated from detailed evaluation. The impacts of each alternative on cultural resources is detailed in Section 4.5 and the affects of each alternative on recreation resources is described in Section 4.7. This section summarizes that discussion, with a particular focus on compliance with the analysis requirements of Section 4(f) of the Department of Transportation Act and Section 6(f) of the Land and Water Conservation Fund Act.

### **8.3.1 Avoidance Alternatives**

Physical constraints preclude realignment of Jordan Road around Lewis and Clark State Park. Broughton Bluff to the south and east is over 200 feet high, and the Sandy River borders the road on the west. An alternative of eliminating the interchange and taking access through Troutdale and across the HCRH bridge over the Sandy River was found unacceptable because weight restrictions on that bridge would reduce access to communities south of the area unacceptably. (See Chapter 2 for a full discussion of alternatives eliminated from consideration.) The interchange must be improved and Jordan Road realigned to provide access to National Forest land north of I-84. The alternatives under consideration represent the full range of reasonable alternatives.

### **8.3.2 Alternative 1**

Alternative 1 is the "no action" alternative. It would have no effect on designated 6(f) resources or designated 4(f) resources. However, it would not meet the goals of the FS or ODOT for development of a western gateway and correction of existing substandard conditions on Jordan Road and at the interchange with I-84.

### **8.3.3 Alternative 2**

Alternative 2 would use Section 4(f) resources, but not Section 6(f) resources. It would realign Jordan Road from one edge of Lewis and Clark State Park (along the Sandy River) to another



(adjacent to Broughton Bluff), and reconstruct the Jordan Road interchange with I-84 in a folded diamond configuration to improve the weave length between the Graham Road interchange and the Jordan Road interchange; improve sight distance, roadway width, horizontal and vertical alignment along Jordan Road; and provide access to National Forest land north of I-84 (see Figure 2.3-2). The realigned Jordan Road would include a new undercrossing of the UPRR line. The existing interchange occupies 15.7 acres, and the new interchange would occupy 27.35 acres of land currently owned by ODOT or the FS and designated for Public Recreation. However, interchange improvements are necessary in order to permit development of the area for recreational use. The existing interchange and access to National Forest land are substandard, and must be improved to support development at the site.

Realigning Jordan Road through the park would improve access to the Sandy River from the park (crossing a road would no longer be necessary). Since river access is the primary recreational function of the park, the realignment would have a beneficial effect on the recreational value of the park. The current Jordan Road alignment occupies approximately 0.6 acres through Lewis and Clark State Park. The realigned road would occupy approximately 0.7 acres. Therefore, the proposed project would use 0.1 acre more of 4(f) resource. The roadway would be upgraded from 10 to 12 foot travel lanes with two-foot shoulders to 12-foot wide travel lanes with six-foot bike lanes on both sides.

The realigned Jordan Road would be closer to Broughton Bluff, which is used by rock climbers. This would not affect the climbing area on the bluffs, but would affect access to the climbing area and to the head of the Lower Elevation Gorge trail. Climbers would have to cross the road to access the bluffs. Two mitigation measures have been proposed to address the safety of recreational climbers:

1. The road would be 50 feet or more from the base of the bluffs; and,
2. A striped and signed pedestrian crosswalk or crosswalks would be constructed to provide a safe access point from the park to the bluffs.

Crossing under the ORNC/UPRR railroad will require excavation of the historic railroad bed to create a 56-foot wide undercrossing which constitutes a "use" of the resource under Section 4(f). The undercrossing would not affect the alignment of the railroad or integrity of the remainder of the line. The appearance of the area from the historic resource would also be altered, but the current development and use of the area has been altered from the historic period, when the Hicklin family homestead occupied the site of Lewis and Clark State Park. Therefore, although the realignment would "use" the railroad (creating an underpass where none currently exists), it would not adversely affect its historical character or function.

### 8.3.4 Alternative 3

Alternative 3 would affect both Section 4(f) property and Section 6(f) land. This alternative would also involve the realignment of Jordan Road and reconstruction of its interchange with I-84 to a folded diamond configuration, with the same impacts on designated Public Recreation land, Lewis and Clark State Park and the ORNC/UPRR line as Alternative 2. In addition, this alternative would construct the gateway center south of I-84 and north of the ORNC/UPRR railroad, on OPRD land encumbered with L&WCF grant restrictions. In order to construct the gateway, the FS would have to acquire the property from OPRD, since the NSA Management Plan specifies that the gateway must be built on National Forest land. The OPRD property contains a gravel parking area constructed with L&WCF monies for use by those seeking access to the Sandy River.

Construction of the gateway would involve approximately 0.1 acres for the facility itself and one acre for a 100-space visitor parking area with landscaping and the right-of-way for the I-84 realignment. The gateway could be considered a recreational facility under the L&WCF guidelines. One purpose of the gateway is to enhance the recreational experience of the NSA by managing the visitor load at recreational facilities in the Gorge. In addition, the gateway will include educational and interpretive exhibits and visitor facilities, consistent with L&WCF objectives. The paved parking lot serving the gateway could also be used by people visiting the site to access the Sandy River or trails north of I-84. Therefore, construction of the Gateway could be considered to replace one recreational use with another.

Replacement of the parking function of the L&WCF site would occur on-site. OPRD has indicated that they would prefer to replace the recreational function of the land with property owned by ODOT on Rocky Butte which is a prime rock-climbing area, or by land owned by the FS which is adjacent to Mayer State Park.

Construction of the gateway adjacent to the historic railroad will alter the view from the railroad and of the railroad from the nearest key viewpoint (Interstate 84) by introducing a structure where none previously existed. This could be considered a "constructive use" of the historic resource. However, this area has been altered since the historic period, when the Hicklin family homestead and farm buildings were located where Lewis and Clark State Park is today. The gateway would be small (approximately 1,500 square feet in area and less than 35 feet in height) and located approximately 15 feet below the grade of the railroad. Landscaping along the edge of the railroad right-of-way would buffer the view of the building from the railroad, and minimize the change in the view of the railroad from I-84. Therefore, no constructive use would occur.

### 8.3.5 Alternative 4

Alternative 4 would also use both Section 4(f) and Section 6(f) resources. This alternative would realign Jordan Road north of the UPRR, parallel to the rail line eastward to the

reconstructed interchange with I-84. The interchange would be constructed in a diamond configuration in this alternative. (See Figure 2.3-4) The existing interchange occupies 15.7 acres of designated public recreation land and the diamond interchange would occupy 29.3 acres.

Because Jordan Road would only be realigned within the area north of the railroad, impacts to the developed portion of Lewis and Clark State Park and the new undercrossing of the historic railroad would not occur. However, the realignment would involve widening Jordan Road (from approximately 28 feet to 36 feet) and filling out into the Sandy River floodway where the road passes next to the railroad bridge embankment. Neither the embankment itself nor the railroad bridge would be affected in this alternative, and therefore no use as described in Section 4(f) would occur.

North of the railroad, the realigned Jordan Road would occupy approximately 1.0 acre of land, 0.06 acres of which is a Section 6(f) resource, encumbered with L&WCF restrictions. The interchange would occupy 0.76 acres for the merge lane. The road would pass over a portion of the gravel parking lot constructed with L&WCF funds and used for recreational parking.

In addition, this alternative would include construction of a minimal gateway facility (in the form of an information kiosk) and a paved parking lot on Section 6(f) land currently owned by OPRD between I-84 and the railroad. The gateway parking lot would replace the parking function lost by realigning Jordan Road. OPRD has indicated that they would prefer to replace the recreational function of the converted land with ODOT-owned property on Rocky Butte, which is a prime rock climbing area, or FS-owned property adjacent to Mayer State Park.

This alternative would avoid construction of a new railroad undercrossing, and, therefore, disturbance to the historic railroad bed. Realigning Jordan Road to parallel the railroad would change the appearance of the area from the historic resource (the UPRR rail line), but would not alter the alignment or function of the railroad itself. The view of the road from the railroad could not be completely buffered with landscaping because the area is too small. Since the area around the railroad has been altered from its historic use and appearance, the introduction of a road parallel to it is not considered significant.

### **8.3.6 Alternative 5**

Alternative 5 is a blended alternative which combines features found in the alternatives already discussed. Alternative 5 would realign Jordan Road along Broughton Bluff, construct a folded diamond interchange, and provide gateway information at a kiosk located between I-84 and the UPRR line. The use of Section 4(f) and Section 6(f) resources would be the same as under Alternative 3.

### 8.3.7 Summary of Effects

All of the action alternatives would use resources protected by Section 4(f) in some way. There is no feasible or prudent alternative to using 4(f) property, other than the no action alternative. The impact to Section 4(f) and Section 6(f) resources is summarized below in Table 8.3-1.

**TABLE 8.3-1  
SUMMARY OF EFFECTS**

<i>Alternative</i>	<i>Feasible &amp; Prudent</i>	<i>Uses Sec. 4(f) Land</i>	<i>Uses Sec. 6(f) Land</i>	<i>Harm to 4(f)</i>	<i>Harm to 6(f)</i>
1	no	no	no	none	none
2	yes	yes	no	medium	none
3	yes	yes	yes	medium	some
4	yes	yes	yes	greatest	greatest
5	yes	yes	yes	medium	some

### **8.4 MEASURES TO MINIMIZE HARM TO SECTION 4(f) AND SECTION 6(f) PROPERTIES**

Section 4(f) requires the USDOT and agencies using USDOT funding to include "all possible planning to minimize harm" to identified 4(f) properties. The design of each alternative would incorporate measures to mitigate or compensate for any harm to historic or public recreation resources as a result of construction of improvements to Jordan Road or the interchange. Section 6(f) requires similar mitigation. These mitigation measures are listed below by alternative.

#### **8.4.1 Alternative 1**

Alternative 1, the "no action" alternative, would not use Section 4(f) or Section 6(f) properties. No mitigation is necessary.



### 8.4.2 Alternative 2

This alternative would use only Section 4(f) property, including Lewis and Clark State Park and the historic railroad bed of the ORNC main line. The following mitigation measures are proposed to minimize harm to these resources:

#### *Lewis and Clark State Park*

- 8.4 - 1. Realignment of Jordan Road would use approximately 0.7 acres of Lewis and Clark State Park that is currently in landscaped lawn. To replace this, 0.6 acres of the existing right-of-way would be given to OPRD. The existing roadway would provide pedestrian access along the river to the National Forest land north of I-84 from Lewis and Clark State Park.
- 8.4 - 2. To ensure the safety of climbers on Broughton Bluff, the realigned roadway would be located at least 50 feet from the base of the bluff.
- 8.4 - 3. To provide safe access from the park to the bluffs, a crosswalk or crosswalks with appropriate signs would be constructed as a part of the realigned road.

#### *ORNC Railroad Main Line*

- 8.4 - 5. The railroad undercrossing has been designed to cross under the main line at a right angle in order to minimize disturbance to the railroad bed.
- 8.4 - 6. A professional archaeologist or historian would observe the excavation of the undercrossing to ensure that any resources uncovered as a result of the construction are appropriately documented and preserved.
- 8.4 - 7. The walls of the undercrossing would be designed and constructed to resemble the historic embankment adjacent to Jordan Road where it crosses under the Troutdale Railroad Bridge.

### 8.4.3 Alternative 3

Alternative 3 would have the same impacts as Alternative 2 on Section 4(f) resources and the same mitigation measures to minimize harm would be incorporated in the project. In addition, this alternative would use Section 6(f) property for the construction of the gateway and parking area. The following additional mitigation measures are proposed for those impacts.

***Section 6(f) property***

- 8.4 - 8. The two parcels subject to Section 6(f) restrictions would be traded for FS or ODOT property (possibly on Rocky Butte or in Mayer State Park) with a higher recreational value and an equal appraised value.
- 8.4 - 9. The parking function served by the gravel lot would be replaced by the paved parking lots serving the gateway.

**8.4.4 Alternative 4**

Alternative 4 would also use both Section 4(f) and Section 6(f) properties. However, it would use land from the area between the UPRR and I-84 rather than Lewis and Clark State Park. The following mitigation measures are proposed to minimize harm to the affected resources.

***Section 4(f) property***

- 8.4 - 10. The two OPRD parcels where the gravel parking lot is located would be traded for property with a higher recreational value and an equal appraised value. ODOT land on Rocky Butte and FS land in Mayer State Park are under consideration.
- 8.4 - 11. The parking function served by the gravel lot would be replaced by the paved parking lot serving the gateway kiosk.
- 8.4 - 12. A landscaped buffer would be planted between the realigned Jordan Road and the ORNC railroad bed to minimize the change in view from the railroad.
- 8.4 - 13. The curved undercrossing of the UPRR railroad would be widened into the Sandy River in order to avoid impacts to the historic bridge and embankment.

***Section 6(f) Property***

The same mitigation measures proposed for impacts to Section 4(f) resources are proposed for impacts to Section 6(f) resources.

**8.4.5 Alternative 5**

Alternative 5 would have the same impacts as Alternatives 2 and 3 on Section 4(f) resources, and the same mitigation measures to minimize harm would be incorporated in the project. This

alternative would have a similar effect on Section 6(f) resources as Alternative 3 but the kiosk is smaller than the gateway. The same mitigation measures to minimize harm would be incorporated in the project.

## **8.5 CONSULTATION AND COORDINATION WITH AFFECTED AGENCIES**

Consultation among the affected agencies has occurred since the beginning of this project. The FS recognized the need for the cooperation and support of ODOT and OPRD in order for the development of the Sandy River Delta site to succeed. As described in Chapter 1 of this EIS, the FS, ODOT, OPRD, and DSL have agreed to cooperate in the development of the Open Space and Management plans for the Sandy River Delta, which includes planning for proposed interchange improvements and the Gateway. Representatives of these agencies have been involved in the design of the alternatives evaluated in this EIS, in the evaluation of impacts, and in the development of mitigation measures. Copies of correspondence from these agencies regarding impacts to Section 4(f) and Section 6(f) properties are included in the analysis file.

## 9.0 OTHER SPECIFICALLY REQUIRED DISCLOSURES

### *Effects of Alternatives on Threatened and Endangered Species and Critical Habitat*

Alternative 1 is the "no action" alternative and would not change current impacts on threatened or endangered species.

If Alternative 2 is selected for implementation, increased boating along the Columbia River could adversely affect the pair of bald eagles nesting on Flag Island. In addition, construction of the boat moorings and steps may affect designated critical habitat for listed salmonids.

Alternative 3 would improve habitat for migrating and breeding waterfowl, and could support a subpopulation of Columbia white-tailed deer.

Alternative 4 would also support introduction of a subpopulation of Columbia white-tailed deer. In addition, the elimination of boating access and improvements to forested riparian habitat would benefit bald eagles.

Alternative 5 would provide both improved open meadow, wetland, and open water habitat for migrating waterfowl, and improved riparian forest habitat for bald eagles, and possibly Columbia white-tailed deer.

The effects of alternatives on threatened and endangered species is discussed in further detail in Section 4.4.

### *Effects of Alternatives on Prime Farm Land, Range Land, and Forest Land*

Although the site was previously farmed, soils are generally poor and the project site is not considered to be prime farm land. While some grazing of cattle has taken place, the project area is not classified range land.

Under the NSA Management Plan, the project site is classified for Public Recreation and Open Space uses. These uses preclude active management of the forest resources or agriculture, although the alternatives would have differing effects on forest resources on the site.

Alternative 1 would not change the current condition. All three action alternatives would implement the goals and policies of the NSA Management Plan for National Forest land, although each would emphasize different goals and have a range of environmental effects.

Alternative 2 would maintain a diverse landscape which would preserve options for vegetation management in the future. The more intense recreational development proposed under Alternative 2 would commit some areas of the site to buildings, roads, trails, and parking. Alternative 3 would emphasize a meadow/grass/shrub landscape and reduce the amount of tree



cover. Alternative 4 would increase tree cover in the project area. Alternative 5 would maintain open habitat on the Thousand Acres, but reforest Sun Dial Island.

The effects of the alternatives on vegetation on the site are discussed in further detail in Section 4.4.

### *Energy Requirements of Alternatives*

There are no significant energy requirements for implementing any of the alternatives considered. Most energy consumption required for the project would involve varying levels for facility construction and reconstruction of the highway interchange.

Impacts of the alternatives on utilities and services are discussed in further detail in Section 4.12.

### *Effects of Alternatives on Minorities and Women*

There would be no direct effects on minorities and women for any of the alternatives. To the extent that minorities and women tend to have lower incomes than the population at large, they may be more affected by the imposition of user fees than other groups.

### *Effects on Wetlands and Floodplains*

A large part of the project area is within the floodways of the Columbia and Sandy rivers. All of the action alternatives would minimally increase the amount of impervious surface within the flood zone. Alternatives 2, 3, and 5 involve construction of facilities within the floodway of the Columbia River. Alternative 4 would locate all facilities south of I-84, outside the floodway of the Columbia River. Alternative 4 would involve a small amount of encroachment into the Sandy River in order to widen Jordan Road.

The high water table results in numerous wetlands on the site, particularly north of I-84. All of the action alternatives would involve filling of wetlands for access improvements, but would also involve creation or enhancement of wetlands north of I-84. Alternatives 2, 3, and 5 would affect approximately one acre of wetland adjacent to I-84. Alternative 4 would affect approximately two acres of wetland or riparian zone along I-84 and where Jordan Road crosses under the UPRR.

The area of each type of wetland created or enhanced would differ among alternatives. Alternative 2 would result in a mix of wetland types. Alternative 3 would result in more palustrine wetland and open water, while Alternative 4 would result in more forested wetland types. The created wetlands proposed under the action alternatives would result in a net gain in wetlands on the site.

The effects on wetlands and floodplains are discussed in further detail in Sections 4.3 and 4.4.

***Compliance with Section 504 of the Vocation Rehabilitation Act and Americans with Disabilities Act (ADA)***

Compliance with provisions of the ADA are incorporated into FS, FHWA, and ODOT regulations and would be required in any contractual agreements involved in the implementation of any alternative. The FS and ODOT would monitor these contracts to assure compliance with regulatory requirements.

Universal design has been incorporated into the recreational facilities proposed for each of the alternatives. Three zones of accessibility are proposed for each action alternative.

***Compliance with Executive Order on Environmental Justice***

The FS has conducted an extensive public information effort to inform and involve potentially affected or interested individuals of the proposed project. Impacts of the project will occur mostly on the site. Minority populations and low-income populations would not be adversely impacted by implementation of any of the alternatives considered, except, perhaps, if a user fee is charged as proposed for Alternatives 2, 3, and 5. In fact, due to the close proximity of the project to a large metropolitan area which includes low income and minority groups, improvements to the site and accommodation of public transit access would have a positive affect on these groups.

Compliance with provisions of this Executive Order are being incorporated into FS regulations and would be required in any contractual agreements involved in the implementation of any alternative. The FS would monitor these contracts to assure compliance with regulatory requirements.



## **10.0 LIST OF PREPARERS**

### **10.1 USDA FOREST SERVICE, COLUMBIA RIVER GORGE NATIONAL SCENIC AREA**

Virginia Kelly, Landscape Architect, Planning Team Leader  
Robin Dobson, Botanist  
Richard Larson, Fish and Wildlife Biologist  
Stan Hinatsu, Recreation Specialist  
Steve Mellor, Hydrologist  
Mike Boynton, Archaeologist  
Mike Ferris, Public Involvement  
Jurgen Hess, Planning and Design Staff Officer  
Dean Apostel, Landscape Architect  
Rick Kneeland, Wildlife Biologist  
Art Guertin, NEPA Coordinator  
Linda Cartright, Range Specialist  
Roberta Hilbruner, Interpretive Specialist  
Sandi Mendonea, Civil Engineer

### **10.2 OREGON DEPARTMENT OF TRANSPORTATION**

Jeanette Kloos, Project Manager

### **10.3 DAVID EVANS AND ASSOCIATES, INC.**

Laura Hudson, Project Manager  
Beverly Bruesch, EIS Manager  
Kristina Gifford McKenzie, Land Use Planner  
Susan Cunningham, Biologist  
Kevin O'Hara, Vegetation Management  
Paul Agrimis, Hydrologist  
Jay Lyman, Traffic Engineer  
Kris Reichenbach, Assistant Writer/Editor  
Jhinde Zhu, Traffic Engineer  
Rob Saxton, Transportation Planner  
Dick Fleming, Preliminary Engineering Design  
Mike Hickey, Preliminary Engineering Design  
Mel Stout, Recreation Planner  
Rex Humphries, Geologist  
Eliot Zais, Hazardous Materials



**10.3.1 Richard Sterling Shaffer, Landscape Architect**

Dick Shaffer, Visual Analysis

**10.3.2 Cogan Owens Cogan**

Jim Owens, Public Involvement

**10.3.3 Archaeological Investigations Northwest, Inc.**

Jo Reese, Project Archaeologist  
Sally Donovan, Historian

**10.3.4 McCulley, Frick, and Gilman**

Eric Hansen, Environmental Scientist  
Kris Wallace, Environmental Scientist

**10.3.5 RZ AGRA, Inc.**

Miriam Grayer, P.E., Geologist

## **11.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE STATEMENT ARE SENT**

Copies of the Draft Environmental Impact Statement (DEIS) were distributed to the following organizations, and Government agencies. Those individuals specifically requesting copies of the DEIS in a postcard mailing, also received a copy. All other parties on the project mailing list automatically received a newsletter summary.

Copies of the DEIS are available for review at the following locations:

Columbia River Gorge National Scenic Area  
902 Wasco Avenue  
Hood River, Oregon 97031

Mt. Hood National Forest  
Supervisors Office  
2955 NW Division Street  
Gresham, Oregon 97030

Oregon Department of Transportation  
Region 1  
123 Front Avenue  
Portland, Oregon 97201

### **11.1 FEDERAL AGENCIES**

Advisory Council on Historic Preservation  
Office of Architectural and Environmental Preservation

Agriculture, U.S. Department of  
Forest Service, Washington Office  
Regional Offices (Regions 1, 2, 3, 4, 5, 6, 9, 10)  
Mt. Hood National Forest  
Gifford Pinchot National Forest  
Soil Conservation Service  
Office of General Council  
Forestry and Range Sciences Lab

Commerce, U.S. Department of  
National Marine Fisheries Service  
NOAA, Ecology and Conservation Division

Defense, U.S. Department of  
Army Corps of Engineers  
U.S. Coast Guard

Energy, U.S. Department of  
Bonneville Power Administration  
Office of Environmental Compliance

Environmental Protection Agency  
Office of Federal Activities  
Region X. EIS Review Coordinator

Federal Energy Regulatory Commission

General Services Administration

Interior, U.S. Department of  
Bureau of Indian Affairs  
Bureau of Land Management  
Fish and Wildlife Service  
Regional Office  
Ridgefield National Wildlife Refuge  
National Park Service  
U.S. Geological Survey

Interstate Commerce Commission  
Labor, U.S. Department of  
Assistant Secretary for Occupational Safety and Health

Transportation, U.S. Department of  
Assistant Secretary for Policy and International Affairs  
Federal Aviation Administration  
Federal Highway Administration

## **11.2 REGIONAL AGENCIES**

Columbia River Gorge Commission  
METRO  
Mid-Columbia Economic Development District  
Northwest Power Planning Council  
Pacific Fisheries Management Council

### **11.3 STATE AGENCIES**

#### State of Oregon

- Department of Agriculture
- Department of Energy
- Department of Environmental Quality
- Department of Fish and Wildlife
- Department of Forestry
- Department of Geology/Mineral Industries
- Department of Transportation
  - Aeronautics Division
  - Region 1 - Region Manager
  - Region 1 - Transportation Planning
  - District 2C
- Department of Revenue
- Employment Division
- Intergovernmental Relations Division
- Joint Legislative Committee
- Resources Planning Section
- Division of State Lands
- Department of Land Conservation and Development
- Economic Development Department
- State Police
- State Marine Board
- Parks and Recreation Department
  - State Headquarters
  - Region 1
    - Lewis and Clark State Park - District Headquarters
    - Rooster Rock State Park
- Tourism Division
- State Historic Preservation Office

#### State of Washington

- Department of Transportation
- Department of Parks and Recreation
- Department of Ecology
- Department of Natural Resources
- Department of Wildlife and Fisheries



#### **11.4 ELECTED OFFICIALS**

##### Oregon

- U.S. Senator Mark Hatfield
- U.S. Senator Bob Packwood
- U.S. Representative Ron Wyden
- U.S. Representative Wes Cooley
- U.S. Representative Elizabeth Furse
- U.S. Representative Jim Bunn
- Office of the Governor
- State Representative John Minnis
- State Senator John Lim
- State Representative Bob Montgomery
- State Senator Greg Walden

##### Washington

- U.S. Senator Slade Gordon
- U.S. Senator Patty Murray
- U.S. Representative Linda Smith
- Office of the Governor
- State Senator Dean Sutherland
- State Representative Marc Boldt
- State Representative Don Benten

#### **11.5 TRIBES**

- Confederated Tribes of the Warm Springs Reservation
- Nez Perce Tribe
- Yakima Tribe
- Confederated Tribes of the Umatilla Indian Reservation
- Affiliated Tribes of NW Indians
- Columbia River Intertribal Fish Commission

#### **11.6 LOCAL GOVERNMENTS**

##### City of Troutdale

- City Council
- Department of Community Development
- Police Department

##### City of Portland

- City Council
- Bureau of Parks and Recreation

Bureau of Water Works  
City of Fairview  
City of Gresham  
City of Wood Village  
City of Camas  
City of Washougal  
Port of Camas-Washougal  
Port of Portland  
Multnomah County  
    Board of Commissioners  
    Planning Department  
    Department of Environmental Services  
    Health Department, Vector and Nuisance Control  
    Sheriff's Office  
    Sheriff's Mounted Possee  
    Drainage District 1  
    Rural Fire Protection District 14  
Clark County  
    Department of Community Development  
    Board of Commissioners

#### **11.7   NEWSPAPERS**

Business Journal  
The Columbian  
The Enterprise  
Gresham Outlook  
Hood River News  
Portland Business Today  
Skamania County Pioneer  
The Gorge Current  
The Oregonian

#### **11.8   LIBRARIES**

Fort Vancouver Regional Library  
Hood River Public Library  
Lewis and Clark College  
Mt. Hood Community College  
Multnomah County Library (14 branches)  
Portland State University

## **11.9 ORGANIZATIONS**

40-Mile Loop Land Trust  
1000 Friends of Oregon  
Association of NW Steelheaders  
Audubon Society - Portland  
Camas-Washougal Chamber of Commerce  
Chinook Trail Association  
Columbia Gorge Coalition  
Defenders of Wildlife  
Crown Point Historical Society  
Ducks Unlimited  
FAUNA  
Friends of Columbia Gorge  
Friends of Multnomah Falls  
Friends of the Sandy River  
Friends of Vista House  
Gresham Area Chamber of Commerce  
Guardians of Larch Mountain  
Historic Columbia River Highway Citizens Advisory Committee  
Mazamas  
Native Plant Society of Oregon  
Nature Conservancy  
NE Multnomah County Community Association  
Oregon Bass and Pan Fish Club  
Oregon Environmental Council  
Oregon Natural Resources Council  
National Wildlife Federation  
NW Coalition of Alternatives to Pesticides  
Oregon Association of Conservation Districts  
Oregon Coastal Wetlands Joint Venture  
Oregon Duckhunters Association  
Oregon Equestrian Trails  
Oregon Historical Society  
Oregon Shorthair Pointer Club  
Oregon Farm Bureau  
Northwest Rivers Council  
Oregon Trout  
Oregon Waterfowl & Wetlands Association  
Oregon Wildlife Federation  
Oregon Wind Shooters Club  
Portland Anglers Club  
Portland Area Chamber of Commerce  
Sandy Steelheaders

Sierra Club  
Trails Club of Oregon  
Troutdale Chamber of Commerce  
Trout Unlimited  
Troutdale Historical Society  
Trust for Public Lands  
Urban Streams Council  
The Wetlands Conservancy  
Vancouver Chamber of Commerce





## 12.0 REFERENCES CITED

### 12.1 PUBLICATIONS AND DOCUMENTS

- Benson, Paul, "Caline3 - A Versatile Dispersion Model for Predicting Air Pollutant Levels Near Highways and Arterial Streets," FHWA/CA/TL-79/23, 1979.
- Boyd, Robert T. "The Introduction of Infectious Diseases Among the Indians of the Pacific Northwest, 1774-1874," unpublished Ph.D. dissertation, Department of Anthropology, University of Washington, Seattle, 1985.
- "Demographic History, 1774-1874," *Northwest Coast*, Wayne Suttles, editor, pp. 135-148. Handbook of North American Indians, vol. 7, William G. Sturtevant, general editor. Washington, D.C., Smithsonian Institution, 1990.
- Boyd, Robert T. and Yvonne P. Hajda, "Seasonal Population Movement Along the Lower Columbia River: The Social and Ecological Context," *American Ethnologist* 14, No. 2 (1987), pp. 309-326.
- Buren, Mike, "Geologic Report: Columbia River Highway I-84: 223rd Avenue to Troutdale Unit 2," Oregon Department of Transportation, Region 1, Highway Division Geology Section, 1993.
- Century West Engineering, "Level I Environmental Assessment for the Sandy River Delta," October 29, 1990.
- Century West Engineering, "Level II Environmental Assessment for the Sandy River Delta," November 29, 1990.
- Columbia River Gorge Commission and USDA Forest Service, "Management Plan for the Columbia River Gorge National Scenic Area," September 1992.
- Columbia River Gorge National Scenic Area, "Draft Watershed Analysis for the Sandy River Delta," December 1994.
- Cowardin, Lewis M., et al. *Classification of Wetlands and Deepwater Habitats of the United States*. US Fish and Wildlife Service, 1979.
- Earth Info Western States USGS-WRD Data (CD-ROM data disk), 1990.
- Economic Resource Associates, "Economic Opportunities Study, Columbia River Gorge National Scenic Area," Columbia River Gorge Commission, 1988.

- Envirosphere Company, "Columbia River Gorge National Scenic Area Recreational Demand Study," 1988.
- Gale Research Co. *Weather of US Cities, Volume 2*. Detroit, MI: Gale Research Co., 1981.
- Hogenson, G.M., and B.L. Foxworthy, "Groundwater in the East Portland Area Oregon," US Geological Survey, Water Supply Paper 1793, 1965.
- Hubbard, L.E., et al., "Water Resources Data Oregon Water Year 1991," US Geological Survey, Oregon District, Water-Data Report OR-91-1, 1991.
- Hubbard, L.E., et al., "Water Resources Data Oregon Water Year 1992," US Geological Survey, Oregon District, Water-Data Report OR-92-1, 1992.
- McCarthy, Kathleen A. and Donald B. Anderson, "Groundwater Data for the Portland Basin, Oregon and Washington," US Geological Survey Open-File Report 90-126, 1990.
- Meister, Richard T., editor. *Farm Chemicals Handbook '92*. Willoughby, Ohio: Meister Publishing Company, 1992.
- Mellor, Steven E., "Hydrologic Report for Sandy River Delta Area Between Railroad and I-84 and East of Sandy River," 1993.
- Metro, "Metropolitan Greenspaces Inventory," 1990.
- Moffatt, Robert L., et al., "Statistical Summaries of Streamflow Data in Oregon: Volume 1-- Monthly and Annual Streamflow, and Flow-Duration Values," US Geological Survey Open-File Report No. 90-118, 1990.
- Monsanto Company, "Rodeo Technical Bulletin," 1990.
- Morse, K.S., and R.S. Anderson, "Tourism in the Columbia River Gorge," 1988.
- Moulton, Gary E., editor. *The Journals of the Lewis and Clark Expedition, 1804-1806*, vol. 6. Lincoln, NE: University of Nebraska Press, 1990.
- Oregon Department of Agriculture, Noxious Weed Control Program, "Noxious Weed Policy and Classification System," 1994.
- Oregon Department of Fish and Wildlife (ODFW), "Sandy River Subbasin Salmon and Steelhead Production Plan," September 1, 1990.
- Oregon Department of Transportation (ODOT), "I-84 Port of Entry Environmental Assessment," 1985.

- Traffic Volume Tables, 1993.
- "Jordan Interchange Interpretive Center Study," 1993.
- Oregon Parks and Recreation Department (OPRD), "Columbia Gorge District Master Plan," 1993.
- (unpublished) Lewis and Clark State Park Monthly Visitation Counts.
- Place, Inc., "Universal Access to Outdoor Recreation," USDA Forest Service, 1993.
- Salix Associates, "Sandy River Delta Natural Resource Inventory," 1992.
- Stalmaster, M.V., and J.R. Newman, "Behavioral Response of Wintering Bald Eagles to Human Activity," *Journal of Wildlife Management*, 42:506-513, 1978.
- Thwaites, Reuben G., editor. *Original Journals of the Lewis and Clark Expedition, 1804-06*, vols. 3 and 4. New York: Dodd & Mead & Co., 1905.
- US Bureau of Reclamation, US Army Corps of Engineers (ACOD), and Bonneville Power Administration, "Columbia System Operation Review Preliminary DEIS," January 1994.
- US Department of Transportation (USDOT), "FHWA Highway Traffic Noise Prediction Model," FHWA-RD-77-108, 1978.
- "Federal-Aid Highway Program Manual," vol. 7, ch. 7, sec. 3: "Procedures for Abatement of Highway Traffic Noise and Construction Noise," distributed with FHWA Transmittal 348, August 9, 1982.
- US Environmental Protection Agency (EPA), "Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances," NTID300.1, 1971.
- User's Guide to Mobile 5A - Mobile Source Emission Factor Model*, EPA-AA-AQAB-92-01. Ann Arbor, MI, March 1993.
- US Fish and Wildlife Service (USFWS), "Revised Columbian White-Tailed Deer Recovery Plan," June 14, 1983.
- "Federally listed and proposed endangered and threatened species and candidate species that may occur in the area of the Sandy River Delta," Ref. No. 1-7-94-SP-342, June 29, 1994.
- US Forest Service (FS), "Columbia River Gorge National Scenic Area Management Plan User's Guide for National Forest Lands."



"Final Environmental Impact Statement on Managing Competing and Unwanted Vegetation," 1988.

"Interpretive Strategy", April 1991.

"Land and Resource Management Plan for the Mt. Hood National Forest," October 1990.

*National Forest Landscape Management*, vol. 2, ch. 1: "The Visual Management System," Agriculture Handbook 462. 1974.

US Forest Service Northwest Region, "Publication R6-ECOL-232A-86," 1986.

"Publication R6-ECOL-257-B-86," 1986.

"Publication R6-ECOL-TP-004-88," 1988.

"Publication R6-ECOL-TP-006-88," 1988.

"Forest Service Manual 2500," 1991.

US Forest Service (FS) and Bureau of Land Management (BLM), "Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl," April 13, 1994.

"Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl," April 1994.

US Soil Conservation Service (SCS), "National Pesticides/Soils Database," 1991.

"Soil Survey of Multnomah County, Oregon," August 1983.

*Uniform Building Code*, 1991 edition, Whittier, CA: International Conference of Building Officials. 1991.

## **12.2 PERSONAL COMMUNICATIONS**

Bryson, David, Hydraulics Engineer, Oregon Department of Transportation. Personal communication, November 19, 1992.

Eli, Tommy, Yakama Indian Nation. Personal communication, November 13, 1992.

Kloos, Jeanette, Scenic Area Coordinator, Oregon Department of Transportation. Correspondence, July 5, 1994.

Kneeland, Richard, Wildlife Biologist, Mount Hood National Forest. Personal communication, November 12, 1992.

McFarland, William, Hydrologist, US Geological Survey, Oregon District Office. Personal communication, October 29, 1992.

Whistler, Terry, Transportation Improvement Program Manager, Metro. Personal communication, April 4, 1994.



## 13.0 GLOSSARY OF TERMS AND ACRONYMS

### 13.1 TERMS

**Accrete** - to grow or increase in size by gradual external addition.

**Action Threshold** - the period of time in which an action should be taken to maintain or reduce unwanted and competing vegetation below the damage threshold. (See Damage Threshold.)

**Adsorb** - to take up by assimilation of a gas, vapor, or dissolved matter by the surface of a solid or liquid.

**Adverse Impact** - a term used to describe unfavorable, harmful, or detrimental environmental changes. Adverse impacts may be significant or not significant.

**Alluvium** - any sediment deposited by flowing water.

**Ambient Condition** - initial background condition sensed or measured at a monitoring or sampling site, as in air quality or noise.

**Ambient Noise** - the background noise associated with a given environment, usually a composite of sounds from many sources, near and far.

**Anadromous** - migrating up rivers from the ocean to spawn in fresh water.

**Aquifer** - a natural underground formation that is saturated with water and from which water can be withdrawn.

**Artifact** - a single, portable, object, made or altered by a human(s); usually culturally diagnostic.

**At-Grade Crossing** - the crossing of two channels of transportation at the same elevation or level.

**Attainment Area** - an area considered to have air quality as good or better than the National Ambient Air Quality Standards as defined in the Clean Air Act. An area may be an attainment area for one pollutant and a non-attainment area for others.

**Background View** - view beginning at a distance from the observer and extending as far toward the horizon as the eye can detect the presence of objects. Skylines or ridge lines against other land surfaces are the strongest visual elements of the "background."



**Biodiversity** - a diversity of biological organisms at the genetic, species, ecosystem, and landscape levels.

**Biofilter** - a type of biological stormwater runoff treatment facility; vegetated indentations in the landscape which may be used where infiltration into the soil is desired.

**Biological Controls** - methods to control undesirable species (usually plants or insects) that do not use synthetic chemicals. Examples of biological control are: controlling water levels, planting desirable plant species, introducing predator species, manual removal of undesirable species, and prescribed fire.

**Biological Weed Controls** - the introduction and management of exotic natural enemies (e.g., phytophagous insects, nematodes, and pathogens) to reduce the abundance of a plant that has become a pest when spread outside of its native range without its native herbivores. Grazing by domestic livestock and cultural methods such as seeding and genetic adaptation are also considered biological controls.

**Biofiltration Swale** - a type of biological stormwater runoff treatment facility; turf grass-vegetated channels with either parabolic or 3:1 horizontal to vertical side slopes, possessing longitudinal slopes in the range of 2 to 6 percent and lengths of 100 to 200 feet or more.

**Breeding Territory** - areas that are actively defended by one or both members of a breeding pair, often through aggressive displays, and are generally centered around the nest site or den site; for most species, breeding territories seldom overlap.

**Bti** - *Bacillus thuringiensis*, a bacterium that kills insect larvae (used for biological pest control).

**Carbon Monoxide (CO)** - a colorless, odorless gas which is toxic because of its tendency to reduce the oxygen-carrying capacity of the blood.

**Clean Water Act: Section 404** - the section requiring a permit for filling or draining wetlands (jurisdictional waters of the United States), administered U.S. Army Corps of Engineers.

**Composting** - a biological process in which organic substances are converted into a humus-like material. Compost, when added to the soil, is capable of improving the tilth, water-holding, and nutrient holding capacity of the soil. Composting of solid waste provides a means of recovering portions of the inorganic and organic segments of the waste stream.

**Correction** - a direct action taken after the damage threshold has been exceeded with the intent of reducing the competing vegetation below the threshold level.

**Cultural Resources** - physical remains of human activity that are sufficiently old to have value in characterizing culture.

**Cumulative Impact** - the change in the environment which results from the incremental impact of the project under study when added to other closely related past, present, and reasonable foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time.

**Damage Threshold** - identifies the extent measured in terms of areal coverage, bio-mass, etc., of unwanted vegetation above which site management objectives are in jeopardy.

**Decibel (dB)** - a unit for expressing the relative intensity (loudness) of sounds. The decibel is the logarithm of the ratio of the intensity of a given sound to the faintest sound discernible by the human ear.

**Decibel, A-Weighted (dBA)** - a measure of noise weighted for the sounds to which the human ear is most sensitive. An increase of 3 dBA is noticeable, and a 10 dBA increase is normally perceived as a doubling of loudness.

**Dredge** - to scoop or suck soil material from the bottom of a waterway in the process of deepening a river, harbor, or channel.

**Early Treatment** - an action to control vegetation initiated before a damage threshold is reached.

**Easement** - a right given by the owner of land to another party for specific limited use of that land. An easement may be acquired by a government through dedication when the purchase of an entire interest in the property may be too expensive or unnecessary.

**Ecosystem** - an ecological community together with its physical environment, considered as a unit.

**Endangered Species** - a species or subspecies which is in danger of extinction throughout all or a significant portion of its range. Endangered species are afforded protection under the Endangered Species Act of 1973, as amended, and State laws.

**Environment** - the physical conditions which exist within the area which will be affected by a proposed project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historical or aesthetic significance. The "environment" includes both natural and manmade conditions.

**Erosion** - the process by which material is removed from the Earth's surface (including weathering, dissolution, abrasion, and transportation), most commonly by wind or water.

**Fault** - a fracture in the Earth's crust forming a boundary between rock masses that have shifted. An active fault is a fault that has moved recently and which is likely to move again. An inactive fault is a fault which shows no evidence of movement in recent geologic time and no potential for movement in the relatively near future.

**40-Mile Loop** - a pedestrian, bicycle, and equestrian trail that was originally planned as a 40-mile loop around the City of Portland, but is still being expanded to include much of Multnomah County; the trail extends north from Forest Park, easterly along the Columbia River to the Sandy River, south to Johnson Creek, west to the Willamette River, and back to Forest Park.

**Freshet** - a sudden, heavy flow of a stream or river resulting from heavy rain or a thaw.

**Grading** - alteration of existing slope and shape of the ground surface.

**Groundwater** - water under the Earth's surface, often confined to aquifers capable of supplying wells and springs.

**Groundwater Recharge** - the natural process of infiltration and percolation of rain water from land areas or streams through permeable soils into water-holding rocks that provide underground storage (i.e., aquifers).

**Habitat** - a place where a plant or animal naturally or normally lives or grows.

**Hazardous Material** - a material or form of energy that could cause injury or illness to humans, animals, or the natural environment.

**Heavy Metals** - metals with densities greater than 5 grams per cubic centimeter.

**Herptile** - a reptile or amphibian.

**Hydraulics** - the science that deals with the dynamic behavior of fluids.

**Hydric** - pertaining to, characterized by, or requiring considerable moisture.

**Hydrography** - the scientific description and analysis of the physical conditions, boundaries, flow, and related characteristics of oceans, lakes, rivers, and other surface waters.

**Hydrology** - the scientific study of the properties, distribution, and effects of water on and below the surface of the earth and in the atmosphere.

**Impact** - the effect, influence, or imprint of an activity or the environment. Impacts include: direct or primary effects which are caused by the project and occur at the same time and place; indirect or secondary effects which are caused by the project and are later in time or farther

removed in distance, but are still reasonably foreseeable. Indirect or secondary effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate and related effects on air and water and other natural systems, including ecosystems.

**Impervious Surface** - ground surface that cannot be penetrated by water; includes paved and compacted surfaces, as well as those covered by buildings.

**Infrastructure** - the physical systems and services that support development and people, including roads, water supply lines, sewage collection pipes, power and communications lines, airports, and the like.

**Interim Biological Controls** - (used on NF lands, see p. 3-23)

**Invasive Species** - a species with a marked ability to immigrate and dominate a site within a relatively short time period.

**Invertebrate** - any animal without a dorsal column of vertebrae; includes protozoans to amphioxus.

**Kilowatt** - a measure of the rate of electrical flow equal to one thousand watts.

**Kilowatt-Hour** - a measure of a quantity of electrical consumption equal to the power of one kilowatt acting for one hour.

**K<sub>oc</sub>** - the index for soil sorption, which measures the tendency of a pesticide to be strongly attached, by chemical or physical bonds, to soil particle surfaces.

**K<sub>s</sub>** - the measure of the persistence of a pesticide as represented by the half-life; the time required for pesticides to be degraded so that their concentration decreases by one-half.

**L<sub>eq</sub>** - a noise level descriptor representing the average sound energy level equivalent to a varying sound level occurring over a given time, as measured in decibels weighted on the "A" scale.

**Land Capability Class** - a system used by the Soil Conservation Service to measure soil qualities including productivity and erosion potential.

**Land Use** - the purpose or activity for which a piece of land or its buildings is designed, arranged, or intended, or for which it is occupied or maintained.

**LD<sub>50</sub>**: Mammalian toxicity of a pesticide is measured as the dose, expressed as milligrams(mg) per kilogram (kg) of body weight, which will theoretically induce mortality in 50 percent of the test animals.



**Level of Service (LOS)** - the different operating conditions which occur in a lane or roadway when accommodating various traffic volumes. A qualitative measure of the effect of traffic flow factors such as special travel time, interruptions, freedom to maneuver, driver comfort, and convenience, and indirectly, safety and operating cost. Levels of service are usually described by a letter rating system of A through F as shown in the table below.

LOS	Definition
A	Represents free-flow traffic conditions with low traffic density. No vehicle waits longer than a fraction of a traffic signal cycle at each signalized intersection. Most vehicles do not stop at all.
B	Stable traffic flow, but the presence of other users in the traffic stream may cause some delay at signalized intersections. Drivers rarely wait through more than a fraction of a signal cycle.
C	Stable traffic flow, but marks the beginning of the range in which the presence of others in the traffic stream may cause some drivers to wait more than one signal cycle to clear the intersection.
D	Approaching the limits of stable flow. Drivers are restricted in their ability to change lanes. Most vehicles must wait more than one signal cycle.
E	Operating conditions (are) at or near the capacity level. Long traffic queues result in extensive delays at signalized intersections, frequently resulting in vehicles waiting more than one signal cycle to clear the intersection. Lengthy delays result for left-turning vehicles.
F	Operating conditions are approaching "gridlock." Queued vehicles are present at each signalized intersection, frequently resulting in blocking adjacent intersections upstream. Most vehicles must wait at least one signal cycle to clear the intersection.

Source: 1985 Highway Capacity Manual

**Liquefaction** - a geologic phenomenon in which surfact and near-surface materials (soils, alluvium, etc.) behave like liquid during seismic shaking, often causing failure of soils to support structures.

**Maintenance Strategy** - strategy that supports the current condition and is appropriate where stability is desired.

**Mammal** - any of a class of higher vertebrates comprising animals that nourish their young with milk secreted by mammary glands and have skin usually more or less covered by hair.

**Migratory Birds** - birds that change location periodically or move seasonally from one region to another.

**Mitigation Measures** - actions to reduce or avoid identified impacts.

**Mobile Source** - a source of air pollution that is related to transportation vehicles, such as automobiles.

**National Environmental Policy Act (NEPA) of 1969, as amended (42USC 4321, 40CFR 1500-1508)** - establishes environmental policy for the nation, provides an interdisciplinary framework for federal agencies to document environmental effects and have federal agency decision-makers take environmental factors into consideration.

**Noise** - annoying, harmful, or unwanted sound.

**North American Plate** - a geo-tectonic plate including Oregon and Washington.

**Noxious** - Injurious or harmful to health.

**Noxious Weed** - any weed designated by the Oregon State Weed Board that is injurious to public health, agriculture, recreation, wildlife, or any public or private property (*Noxious Weed Policy and Classification System*, 1994).

**NSA Management Plan** - *Management Plan for the Columbia River Gorge National Scenic Area*, adopted by USDA Forest Service and Columbia Gorge Commission in 1992.

**Obtrusiveness** - a visual quality of an object expressing its perceived visibility with respect to its surroundings.

**Open Space** - any parcel or area of land or water essentially unimproved and devoted to a use such as preservation of natural resources, outdoor recreation not requiring development of playfields or structures, and public health and safety (e.g., flood control).

**Particulate** - of or relating to minute separate particles.

**Peak Hour** - in reference to transportation systems, the hour during which the highest percentage of traffic flow occurs.

**Percent Slope** - a common way of expressing the steepness of the slope of terrain, which is derived by dividing the change in elevation by the horizontal distance traversed. An increase of 20 feet elevation over a 100 foot distance is a 20 percent slope.

**Perched Groundwater** - groundwater that rests on an impermeable surface (e.g., clay or rock) which is above the surrounding water table.

**Percolation** - downward movement of groundwater through soil and bedrock.

**Permeability** - the condition of having openings or small gaps that allow liquids or gases to pass through; a soil is said to have rapid permeability if water passes through it quickly.

**pH** - unit of measurement of acidity and alkalinity, with a measurement of 7 being neutral.

**Plant Community** - a group of plant species commonly occurring together in roughly similar proportions.

**PM-10** - the current standard for measuring the amount of solid or liquid matter suspended in the atmosphere ("particulate matter including dust"). Refers to the amount of particulate matter over 10 micrometers in diameter. The smaller PM-10 particles penetrate to the deeper portions of the lung, affecting sensitive population groups such as children and people with respiratory diseases.

**Potable** - fit to drink.

**Precipitation** - any form of rain, hail, sleet, mist, fog, or snow.

**President's Plan** - President Clinton's *Forest Plan for a Sustainable Economy and Sustainable Environment* (1993) and the subsequent *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl* (Forest Service and BLM, 1994).

**Rare Species** - a species or subspecies, although not currently threatened with extinction, that exists in such small numbers throughout its range that it may be endangered if the quality of its environment worsens.

**Recycling** - any variety of processes whereby waste is separated for reuse or reprocessing into a useful form.

**Richter Scale** - a logarithmic scale developed in 1935/36 by Dr. Charles F. Richter and Dr. Beno Gutenberg to measure earthquake magnitude by the amount of energy released, as opposed to earthquake intensity as determined by local effects on people, structures, and earth materials.

**Riparian Area** - the area immediately adjacent to a stream or river that directly contributes to the water quality and habitat components of the water body.

**River and Harbor Act: Section 10** - the section requiring a permit for placing structures in navigable waters, administered by the U.S. Army Corps of Engineers.

**RM** - river mile.

**Salinity** - the concentration of dissolved solids or salt in water.

**Salmonid** - resembling or characteristic of a salmon; of or belonging to the family Salmonidae, which includes salmon, trout, and whitefish.

**Sediment** - material that settles to the bottom of liquid or air.

**Sedimentation** - the act or process of depositing sediment.

**Sensitive Species** - those plant or animal species that have been identified by Federal, State, or local agencies, or by conservation groups as being either threatened with extinction, rare, declining in population, unusual (such as species occurring outside of its usual range) or of other special interest, or vulnerable to impacts.

**Seral** - pertaining to a succession of plant communities in a given habitat leading to a particular climax association; a stage in a community succession.

**Shoo-Flies** - temporary re-routing of a railway or roadway to allow for reconstruction of the existing alignment.

**Significant Effect** - considers both the "context" and "intensity" of proposed action. Action must be analyzed in context of society as a whole, the affected region, affected interests, and the locality, and will vary with the setting of the action. The intensity or severity of an effect is determined by considering:

- the degree to which the action affects public health or safety;
- the action's proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas;
- the degree to which the effects on the human environment are likely to be highly controversial;
- the degree to which the action would establish a precedent for future actions with significant effects;
- whether the action is related to other actions with individually significant but cumulatively significant effects;
- the degree to which the action may adversely affect resources listed in, or eligible for, the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources;
- the degree to which an action would adversely effect an endangered or threatened species or its critical habitat as defined by the Endangered Species Act, as amended; and
- whether or not the action would result in a violation of a Federal, State or local law or regulation imposed for the protection of the environment.



**Silt** - a sedimentary material consisting of fine mineral particles intermediate in size between sand and clay.

**SPL** - Sound Pressure Level; a measurement of noise.

**State Implementation Plan (SIP)** - document prepared by states, and submitted to EPA for approval, which identifies actions and programs to be undertaken by the State and its subdivisions to implement their responsibilities under the Clean Air Act.

**Statewide Planning Goals** - Oregon's land use planning policies created in 1973 under SB 101 and including 19 goals; local comprehensive plans implement the Statewide Planning Goals.

**Stationary Emission Source** - a source of air pollution that is not mobile, such as a heating plant or an exhaust stack from a laboratory.

**Submerged or Submersible land** - land located below the ordinary high water line of a river or stream.

**Surface Water** - water in lakes, streams, or rivers, as distinct from subsurface groundwater.

**Swale** - a low tract of marshy land.

**Taxa** - a group of organisms constituting one of the categories or formal units in taxonomic classification, such as the phylum, order, family, genus, or species, and characterized by common characteristics in varying degrees of distinction.

**Threatened Species** - a species threatened by the possibility of extinction. Threatened species are afforded protection under the Endangered Species Act of 1973, as amended, and State laws.

**Tidal** - relating to the periodic rising and falling or flowing and ebbing of ocean waters.

**Topography** - the graphical description on a map of the exact physical configuration of a place or region; the features of a place or region.

**Toxic** - harmful, destructive, or deadly; poisonous.

**Tributary Discharge** - sediments deposited when a stream or river flows into a larger body of water.

**Turbidity** - sediment or foreign particles stirred up or suspended in water; muddy; cloudy.

**Vector** - an organism that carries disease from one host to another.

**View Corridor** - vista formed by regularly placed buildings, landscaping, topography, etc.

**Viewpoint** - a location from which a site is visible.

**Viewshed** - the geographic area from which a site is visible; a collection of viewpoints.

**Visual Quality Objective (VQO)** - A desired level of excellence based on physical and sociological characteristics of an area. Refers to degree of acceptable alteration of the characteristic landscape.

**Wetlands** - areas at least periodically wet or flooded, where the water table stands at or above the land surface (bogs and marshes). Also those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. As defined by Federal agencies, wetlands are areas that contain soils showing signs of frequent and/or sustained inundation, plant species adapted to wet conditions, and signs of water movement through the area.

**Wildlife Corridor** - a natural corridor, such as an undeveloped ravine, that is frequently used by wildlife to travel from one area to another.

**13.2 ACRONYMS AND ABBREVIATIONS**

ACOE	U.S. Army Corps of Engineers
ADA	Americans with Disabilities Act
AQMA	Air Quality Maintenance Area
BLM	Bureau of Land Management
BPA	Bonneville Power Administration
CAAA	Clean Air Act (of 1990) and Amendments
CFR	Code of Federal Regulations
cfs	cubic feet per second
CRGC	Columbia River Gorge Commission
CRGNSAA	Columbia River Gorge National Scenic Area Act
CWA	Clean Water Act
CO	carbon monoxide
dBA	decibels, A scale
dbh	diameter at breast height
DEQ	Oregon Department of Environmental Quality
DFC	desired future condition
DLC	Donation Land Claim
DSL	Oregon Division of State Lands
EIS	Environmental Impact Statement
EMF	electromagnetic field
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
FEMAT	Forest Ecosystem Management Assessment Team
FHWA	Federal Highway Administration
FS	Forest Service (U.S. Department of Agriculture)
FSH	Forest Service Handbook
FSM	Forest Service Manual
GMA	General Management Area (of the NSA)

gpd	gallons per day
gpm	gallons per minute
HCRH	Historic Columbia River Highway
IA	(confirm on p. 3-9) synthetic rainfall distribution measurement
IDT	interdisciplinary team
kg	kilogram
K <sub>oc</sub>	(K) = constant; (oc) = organic carbon
K <sub>s</sub>	(K) = constant; (s) = soil
l	liter
LD <sub>50</sub>	lethal dose causing 50 percent mortality (see glossary for further detail)
L <sub>eq</sub>	equivalent noise level
LOS	level of service
L&WCF	Land and Water Conservation Fund
Metro	the regional government covering Clackamas, Multnomah and Washington Counties in Oregon (formerly known as the Metropolitan Service District, but the name has been officially shortened to Metro)
mg	milligram
MHNF	Mt. Hood National Forest
mph	miles per hour
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act (of 1969), as amended
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOx	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NRHP	Naitonal Register of Historic Places
NSA	National Scenic Area (Columbia River Gorge)
NWI	National Wetlands Inventory
NWPC	National Pipeline Corporation
ODF	Oregon Department of Forestry



ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
OPRD	Oregon State Parks and Recreation Department
ORNC	Oregon Railway and Navigation Company
ORV	off-road vehicles
PAOT	persons at one time
ppm	parts per million
RIC	recreation intensity class
ROD	Record of Decision
ROW	right-of-way
RTP	Regional Transportation Plan
SCS	Soil Conservation Service (U.S. Department of Agriculture)
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SLM	sound level management
SMA	Special Management Area (of the NSA)
SOR	system operation review
SOS	System Operation Strategies
ST&E	sensitive, threatened, and endangered (species)
STIP	Statewide Transportation Improvement Program
TIP	Transportation Improvement Program
TSP	total suspended particulates
UBC	Uniform Building Code
UPRR	Union Pacific Railroad
USDA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation
USFWS	Fish and Wildlife Service (U.S. Department of the Interior)
USGS	U.S. Geological Survey
VMS	Visual Resources Management

VOC	volatile organic compound (including benzene, toluene, formaldehyde, xylene, etc.)
VQO	Visual Quality Objective
W&SR	Wild and Scenic River designated under the federal Wild and Scenic Rivers Act
WRD	Oregon Water Resources Department



## 14.0 INDEX

### Accessibility

in alternative 1:	4-92
in alternative 2:	4-93
in alternative 3:	4-95
in alternative 4:	4-96
in alternative 5:	4-98

### Air quality

in alternative 1:	4-102
in alternative 2:	4-104
in alternative 3:	4-106
in alternative 4:	4-107
in alternative 5:	4-107
existing air quality:	3-48, 3-50
plans and regulations:	3-50
standards	3-48, 3-49
summary of effects	4-108

### Alternatives

considered in detail:	2-4
land use, eliminated:	2-2
interchange, eliminated:	2-3

Archaeological resources issues: 1-19

### Columbia River

hydrologic regulations:	4-18
system operation review:	4-39

Columbia River Gorge NSA Act: 1-9

Columbia River Gorge NSA Management Plan: 1-10, 3-31

### Conformity with SIP

alternative 2:	4-104
alternative 3:	4-106
alternative 4:	4-107
alternative 5:	4-107

Cost estimates: 2-35



<b>Cultural resources:</b>	3-22, 3-26, 5-1
alternative 1:	4-47
alternative 2:	4-47
alternative 3:	4-48
alternative 4:	4-49
alternative 5:	4-49
historic:	3-27
prehistoric:	3-26
protection:	3-27
 <b>Design guidelines:</b>	 2-6
 <b>Dredge disposal:</b>	 4-19, 4-39
 <b>EMF emissions</b>	
alternative 2:	4-136
alternative 3:	4-137
alternative 4:	4-138
alternative 5:	4-140
 <b>Facilities proposed</b>	
bicycle and pedestrian:	3-47
in alternative 1:	2-18
in alternative 2:	2-20, 4-77
in alternative 3:	2-25, 4-79
in alternative 4:	2-29, 4-80
in alternative 5:	2-32, 4-81
exposure to noise:	4-110, 4-112, 4-114, 4-115
 <b>Fish/wildlife</b>	
effects in alternative 1:	4-23
effects in alternative 2:	4-27, 4-28
effects in alternative 3:	4-32
effects in alternative 4:	4-35
effects in alternative 5:	4-37, 4-38
habitat restoration/enhancement issues:	1-19
wildlife habitat:	3-15
 <b>Geology</b>	
effects of alternative 1:	4-2
effects of alternative 2:	4-3
effects of alternative 3:	4-4
effects of alternative 4:	4-5
effects of alternative 5:	4-6

geologic formation and rock units:	3-2
geologic hazards:	3-3
mineral and energy resources:	3-4

**Geomorphology**

geology:	3-3
hydrology:	3-5

**Habitat types**

summary table:	3-18
----------------	------

**Herbicide application**

in alternative 2:	4-137
in alternative 3:	4-138
in alternative 4:	4-139
in alternative 5:	4-139

**Historic Columbia River Highway:** 3-45**Hydrology**

in alternative 1:	4-9
in alternative 2:	4-11
in alternative 3:	4-13
in alternative 4:	4-15
in alternative 5:	4-17
climate:	3-4
groundwater:	3-8, 4-9, 4-11, 4-13, 4-15, 4-17, 4-19, 4-20
riparian areas:	4-10, 4-12, 4-14, 4-16, 4-17, 4-20
surface water:	3-5, 4-9, 4-11, 4-13, 4-15, 4-17, 4-19, 4-20
water quality:	4-10, 4-12, 4-14, 4-16, 4-18, 4-20
wetlands:	3-10, 4-10, 4-12, 4-14, 4-16, 4-17, 4-19, 4-20

**I-84 right-of-way:** 1-3**Implementation**

phasing:	2-17
property exchange or purchase:	2-17
vegetation management:	2-17

**Interim access**

in alternative 2:	4-94
in alternative 3:	4-95
in alternative 4:	4-97
in alternative 5:	4-99

<b>Jordan Road interchange:</b>	3-44
in alternative 2:	4-77
in alternative 3:	4-79
in alternative 4:	4-80
in alternative 5:	4-82
diamond interchange:	4-90
intersections:	4-90
modifications:	1-7, 1-15
no modifications:	4-89
 <b>Landscape patterns</b>	
in alternative 1:	2-18, 4-22
in alternative 2:	2-20, 4-24, 4-77
in alternative 3:	2-25, 4-30, 4-79
in alternative 4:	2-28, 4-34, 4-80
in alternative 5:	2-32, 4-36, 4-81
 <b>Land uses:</b>	5-1
in alternative 1:	4-53
in alternative 2:	4-55
in alternative 3:	4-57
in alternative 4:	4-60
in alternative 5:	4-62
existing on site:	3-28, 4-53, 4-55
plans, policies, and regulations:	3-31, 4-54
surrounding:	3-20
 <b>Level of service:</b>	3-46
in alternative 1:	4-92
in alternative 2:	4-93
in alternative 3:	4-94
in alternative 4:	4-96
in alternative 5:	4-98
definition:	Appendix H
 <b>Lewis and Clark State Park</b>	
facilities:	3-38, 3-39
OPRD goals for:	3-37
parking and river access:	1-8
section 4(f) resources:	8-3, 8-10
subarea:	1-2
 <b>Management strategies</b>	
in alternative 1:	2-19

in alternative 2:	2-22	
in alternative 3:	2-26	
in alternative 4:	2-30	
in alternative 5:	2-33	
land use/recreation management:	2-16	
noxious weed control:	2-16	
security/law enforcement/emergency access management:		2-16
vegetation management:	2-12	

#### **Migratory species**

effects of alternative 1:	4-24
effects of alternative 2:	4-30
effects of alternative 3:	4-33
effects of alternative 4:	4-36
effects of alternative 5:	4-38

#### **Mt. Hood National Forest Plan:** 1-11, 3-34

#### **Noise**

effects of alternative 1:	4-110
effects of alternative 2:	4-112
effects of alternative 3:	4-114
effects of alternative 4:	4-115
effects of alternative 5:	4-116
existing environment:	3-52

#### **ODOT**

primary objectives:	1-5
triangle subarea:	1-2

#### **OPRD Columbia Gorge District Master Plan:** 1-5, 1-13, 3-35, 3-37, 4-54, 4-57, 4-59, 4-61, 4-63

#### **ORNC Railroad:** 3-27, 8-1, 8-10

#### **Oregon Transportation Planning Rule:** 3-36

<b>Parking:</b>	3-46
in alternative 1:	4-91
in alternative 2:	4-77, 4-93
in alternative 3:	4-79, 4-95
in alternative 4:	4-80, 4-96
in alternative 5:	4-82, 4-98
implementation Considerations:	2-17



<b>Portland/Troutdale Airport Master Plan:</b>	3-35
<b>President's Plan:</b>	1-11, 3-34, 4-18, 4-55, 4-57, 4-60, 4-62, 4-63
<b>Public involvement:</b>	1-16
<b>Public transportation</b>	
in alternative 2:	4-94
in alternative 3:	4-95
in alternative 4:	4-97
in alternative 5:	4-99
<b>Recreation:</b>	5-1
in alternative 1:	4-66
in alternative 2:	4-67
in alternative 3:	4-69
in alternative 4:	4-70
in alternative 5:	4-72
existing uses:	3-38
<b>"Rodeo" herbicide:</b>	4-131
<b>Sandy River Delta</b>	
subarea:	1-2
planning:	1-15
<b>Scenic resources</b>	
in alternative 1:	4-77
in alternative 2:	4-77
in alternative 3:	4-79
in alternative 4:	4-79
in alternative 5:	4-81
key viewing areas:	3-42
management:	3-40
viewpoints description:	3-43
<b>Site contamination:</b>	3-56
in alternative 1:	4-136
in alternative 2:	4-137
in alternative 3:	4-138
in alternative 4:	4-139
in alternative 5:	4-140

**Soils**

effects of alternative 1:	4-2
effects of alternative 2:	4-3
effects of alternative 3:	4-4
effects of alternative 4:	4-5
effects of alternative 5:	4-6
Dabney Loamy Sand:	3-2
Faloma Silt Loam:	3-2
Faloma Silt Loam, Protected:	3-2
Haplumbrepts:	3-2
Pilchuck Sand:	3-2
Rafton Silt Loam, Protected:	3-2
Riverwash:	3-2
Sauvie Silt Loam:	3-2

<b>STE species:</b>	3-15, 3-17, 3-22, 5-1
in alternative 1:	4-23
in alternative 2:	4-29
in alternative 3:	4-33
in alternative 4:	4-36
in alternative 5:	4-38
plants, summary table:	3-16
wildlife species, summary table:	3-19
exotic wildlife species:	3-21

**Traffic generation**

in alternative 1:	4-91
in alternative 2:	4-93
in alternative 3:	4-94
in alternative 4:	4-96
in alternative 5:	4-98
gateway:	4-85
recreational user:	4-85

<b>Traffic volumes:</b>	3-45
1998 totals:	4-87
2015 totals:	4-88

**Transportation**

in alternative 1:	4-91
in alternative 2:	4-92
in alternative 3:	4-94
in alternative 4:	4-96
in alternative 5:	4-97

bus services:	3-47
existing road system:	3-43
planned system improvements:	3-47
rail system:	3-47

<b>Utilities and services:</b>	3-54
in alternative 1:	4-121
in alternative 2:	4-121
in alternative 3:	4-124
in alternative 4:	4-125
in alternative 5:	4-127

<b>Vegetation management</b>	
in alternative 1:	4-22
in alternative 2:	4-24
in alternative 3:	4-31
in alternative 4:	4-34
in alternative 5:	4-37
implementation considerations:	2-17

<b>Wastewater treatment and solid waste disposal</b>	
in alternative 2:	4-122
in alternative 3:	4-124
in alternative 4:	4-126
in alternative 5:	4-127

<b>Water supply</b>	
in alternative 2:	4-121
in alternative 3:	4-124
in alternative 4:	4-125
in alternative 5:	4-127

**APPENDIX A**

**SHPO Consultation**





FOREST SERVICE DETERMINATION OF EFFECT  
PACIFIC NORTHWEST REGION  
COLUMBIA RIVER GORGE NATIONAL SCENIC AREA

## PROJECT DATA:

NAME/KIND I-84 Bridge Expansion  
COUNTY Multnomah  
USGS QUADS Camas Wash--Oreg 1:24,000

Attachment C (3/82, revised 12/86)  
USFS/SHPO Memorandum of Agreement

Date July 30, 1993

## Enclosures:

     Inventory report  
  X   Description of expected effects  
     Description of affected resources  
     Site report  
     Other                                 

## Responsible Official:

Name Art Carroll

## Mailing Address:

902 Wasco Ave. Suite 200  
Hood River, OR 97031

For further information, contact: Name Thomas J. Turck Phone: 503 386-2333  
Archeologist

The Criteria of Effect and Adverse Effect listed in 36 CFR 800.9 have been applied to the proposed undertaking described in the accompanying materials, to determine the nature of effect, if any, on cultural resources eligible for or listed on the National Register of Historic Places. The paragraph below describes the results of our analyses, detailed supporting documentation is enclosed, for your permanent files.

  X   In accordance with 36 CFR 800.5(b), we have determined that the proposed undertaking will have "NO EFFECT" on any listed or eligible cultural resources. An adequate inventory, certified by the Forest's professional cultural resource specialist, did not discover any listed or eligible cultural resources that may be impacted by the project. We will retain documentation of this determination and proceed with project implementation as proposed unless you object within 15 days of receipt of this notice.

     In accordance with 36 CFR 800.5(d), we have determined that the proposed undertaking will have "NO ADVERSE EFFECT" on any listed or eligible cultural resources. We will document this determination to the Advisory Council on Historic Preservation and proceed with project implementation as proposed unless the ACHP objects within 30 days of receipt of this notice.

     In accordance with 36 CFR 800.5(e), we have determined that the proposed undertaking will have "ADVERSE EFFECT" on listed or eligible cultural resources. A description of each affected resource and a description of the project's effects are attached. We will proceed with consultation to avoid or reduce these effects.

For SHPO Use

Please indicate your opinion of our determination by marking the appropriate line below, then sign and return this form to us.

  X   concur  
     do not concur  
Remarks:

JAN PRIOR

RESERVE D

AUG 09 1993

Signed  
Date

Le Gulser  
AUG 05 1993

COLUMBIA RIVER GORGE  
NATIONAL SCENIC AREA



Oregon

U.S.  
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COLUMBIA RIVER GORGE  
NATIONAL SCENIC AREA

PARKS AND  
RECREATION  
DEPARTMENT

STATE HISTORIC  
PRESERVATION OFFICE

November 8, 1994

Michael Boynton  
Columbia River Gorge Nat. Scenic Area  
USDA Forest Service  
902 Wasco Avenue, Suite 200  
Hood River, OR 97031

RE: Lewis & Clark State Park  
Multnomah County

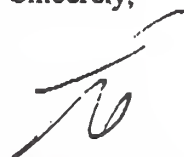
Dear Michael:

We concur with your finding that the Hicklin Ranch (OR-MU-65) site is not eligible as an archaeological site under criterion D due to the lack of integrity. In your letter, you indicated that you felt the Hicklin Ranch site may be eligible under criterion A for its historical event values for local and state themes that include settlement, agriculture, government and transportation. You also indicate that you feel these values were recovered through the historical research report by Sally Donovan.

We concur with your recommendations of eligibility for the Union Pacific Bridge (criterion C) and railroad main-line (criterion A) through the project area.

We concur with your findings of "no adverse effect" for the project as a whole.

Sincerely,



Leland Gilson  
SHPO Archeologist



1115 Commercial St. NE  
Salem, OR 97310-1001  
(503) 378-5001  
FAX (503) 378-6447





11/2/95  
mjb

December 22, 1994

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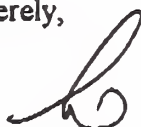
Michael Boynton  
Columbia Gorge Scenic Area  
902 Wasco Ave, Suite 200  
Hood River, OR 97031

RE: Sandy River Delta  
DOE  
Multnomah County

Dear Michael:

The SHPO staff has reviewed your determination of effect for Alternative 5 for access to, and recreation on, the Sandy River Delta site using the Sandy River Diversion Dam. We concur with your finding of "no adverse effect".

Sincerely,



Dr Leland Gilsen  
SHPO Archaeologist



1115 Commercial St. N  
Salem, OR 97310-1001  
(503) 378-3001  
FAX (503) 378-6447





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